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# Basin level responses to a large flood: completion report project number INT 96073-RJVA

David H. Bennett

Coop Agreement
Univ of IDAHO

FINAL REPORT FOR RESEARCH AGREEMENT
#INT-96073-RJVA
"Basin Level Response of Fishes to a Large Flood"
FS Contact: Dr. Bruce Rieman
CoOp Contact: Dr. David Bennett

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## ABSTRACT

We sampled 67 tributaries of the main Coeur d' Alene River and North Fork of the Coeur d' Alene River upstream of the confluence in summer 1996 to assess the influence of a basin wide flood on the abundance of westslope cutthroat trout *Oncorhynchus clarki lewisi.* Each stream was partitioned into three reaches of equal length and three-30 m sites randomly selected were sampled by single pass electrofishing. One of the nine sampling locations was sampled with two additional electrofishing passes to obtain population abundance and density estimates. A total of 1627 westslope cutthroat trout were collected in 1996. Cutthroat trout density estimates averaged 0.0425/$m^2$ and ranged from 0.1966/$m^2$ (Bear Creek) to 0.0016/$m^2$ (Bootjack and Brett creeks). I found highly significant decreases ($p<0.0001$) in density between 1994 and 1996 for 38 streams sampled during both years suggesting possible adverse effects from the high stream discharges in 1996. However, no missing length classes were consistently found in all the streams sampled suggesting that if the flood had an adverse affect on the cutthroat trout population, the effect was not size specific. Number of cutthroat trout < 60 mm (age-0) collected varied across the drainage and was significantly ($p<0.05$) correlated with wetted stream width and number of cutthroat trout > 60 mm at the site level but not at the reach and stream levels. Analyses of elemental calcium and strontium levels indicated wide differences among streams with the highest concentrations measured in the Coeur d' Alene River.

**Acknowledgments**

This research was supported in part by funds provided by the Intermountain Research Station, Forest Service, U.S. Department of Agriculture. I thank Dr. Bruce Rieman for technical and supervisory assistance and provocative discussions. Field assistance was provided by Ann Abbott, Matt Butchko, Steve Corbett, Bill Edwards, and Jason Smith. Forest Service personnel, especially Ed Lider, provided day to day assistance.

## Introduction

Westslope cutthroat trout *Oncorhynchus clarki lewisi* were historically abundant in the Coeur d' Alene River basin (Maclay 1940). Over fishing, logging activities, road construction, and mineral extraction have reduced numbers of cutthroat within the drainage (Lewynsky 1986; Hunt and Bjornn 1992). The Idaho Department of Fish and Game imposed angling regulations which included gear restrictions, minimum size limits (1975), and catch and release on sections of the North Fork (1988) and main Coeur d' Alene (1985) rivers, similar to the St. Joe River and Kelly Creek (Hunt and Bjornn 1992). Although other westslope cutthroat trout populations responded to regulation changes, little change in cutthroat trout abundance occurred in the Coeur d' Alene River system suggesting that habitat may be related to the low cutthroat trout abundance.

Several authors have suggested a relationship between habitat conditions and salmonid fish abundance (Bozek and Hubert 1992; Platts 1979; Chisholm and Hubert 1986; Lanka et al. 1987; Kozel and Hubert 1989; Fausch 1989). The quality and quantity of aquatic habitat within the Coeur d' Alene River basin is related to a long history of habitat insults. Road construction, timber harvest, and mineral extraction have occurred in the basin for nearly 100 years (Maclay 1940).

One of the potential effects associated with these activities is in altering the natural hydrograph. Kappesser (1993) suggests that forest management activities can influence the timing and peak of a river's hydrograph. Rain-on-snow events are common in this drainage and show that peak flows have occurred during November through February approximately every 2 years since 1939. Peak flows can increase bedload scour that alter channel characteristics and may present a direct risk to overwintering westslope cutthroat populations and indirectly by altering rearing habitat. The purpose of this

project was to investigate effects of high discharge during the winter 1995-1996 on cutthroat trout abundance in the Coeur d' Alene drainage.

## Objectives

1. To describe the response of stream fishes to the February 1996 flood event in the Coeur d' Alene River Basin.
2. To expand the existing sample of juvenile cutthroat trout occurrence across a gradient of stream size, elevation and channel gradient.
3. To review statistical models and potential analytical approaches for evaluation of spatial patterns in phenotypic diversity.
4. To collect water samples and contract for analysis of Sr and Ca content of ten select streams distributed throughout the Basin.

## Study Area

The Coeur d' Alene River originates on the Pend Oreille divide near the Idaho-Montana border and flows southwesterly for approximately 190 km until entering the southeastern end of Coeur d' Alene Lake (Figure 1). Our study area encompassed the entire Coeur d' Alene River basin upstream from the confluence of the North Fork of the Coeur d' Alene and the main Coeur d' Alene rivers, an area of approximately 2,280 $km^2$. Elevations within the study area range from 700 to 1850 m above sea level. The dominant geology type within the river basin is weathered belt-series rock (Kappesser 1993). Most of the study area is part of the Idaho Panhandle National Forests and managed by the US Forest Service.

One of the more prominent features of the study area is the high density of roads. Roads parallel most tributary streams within the river basin except in sections of the

upper Coeur d' Alene River and Independence Creek. Maximum road densities in some portions of the study area exceed 19 km/km$^2$ (Dunnigan 1997).

Species composition in the upper drainages consist of mainly westslope cutthroat trout (Dunnigan 1997). Torrent sculpins *Cottus rhotheus*, shorthead sculpins *Cottus confusus* and speckled dace *Rhinichthys osculus* have been reported in the upper and lower portions of the river basin (Hunt and Bjornn 1992) and rainbow trout *O. mykiss*, brook trout *Salvelinus fontinalis*, mountain whitefish *Prosopium williamsoni*, longnose suckers *Catostomus catostomus* and northern pikeminnow *Ptychocheilus oregonensis* are generally found in the lower portion of the river basin (Hunt and Bjornn 1992). Bull trout originally reported within the Coeur d' Alene River Basin (Maclay 1940) are believed extinct (Dunnigan 1997).

## Methods

During 1996 we sampled 67 streams within the Coeur d' Alene River basin. Twenty three were tributaries of the North Fork of the Coeur d' Alene and the remaining 44 were tributaries of the main Coeur d'Alene River. Sampling locations were randomly selected based on the following: 1) the length of each stream was measured on a 7.5 minute quadrangle US Geological Survey topological map, and divided into three reaches of equal length; 2)generally three-30 m sites from each reach were randomly selected for single pass electrofishing using a Smith Root Model 12 POW backpack electrofisher; and, 3) one of the nine locations within each stream was randomly selected for estimating absolute abundance by depletion. Three electrofishing passes were made in the locations selected for depletion. Fish collected were placed in live boxes upstream of the sample section following identification, enumeration. and fork length determination.

We measured several characteristics of the physical habitat. Wetted stream width (± 0.1 m) was measured at each sampling site. Stream temperatures were recorded (C) using a pocket thermometer at approximately 0800, 1200 and 1600 h. Visual habitat

complexity estimates ranging from 1 (low complexity) to 10 (high complexity) were made throughout the sample site. A 500 ml water sample was taken in the channel thalweg from six streams for elemental calcium and strontium analyses.

Estimates of population abundance and capture efficiency were calculated for selected multiple pass locations using the maximum likelihood estimator (Van Deventer and Platts 1983). Sampling locations where less fish were collected on the first pass than the second were not used to estimate efficiency. Capture efficiency estimates for the first pass calculated from the maximum likelihood estimator (Van Deventer and Platts 1983) were used to predict cutthroat trout density ($No/m^2$) in all streams by dividing the number of cutthroat trout collected on the first pass by the mean sampling efficiency for all streams. Estimated densities of cutthroat trout collected in 1996 were compared to those from 1994. High (1996) versus low (1994) flows prevailed in the winter/spring of those years.

We collected water samples from six streams in the Coeur d' Alene basin to estimate elemental calcium (Ca) and strontium (Sr) concentrations. Samples were collected in acid cleaned plastic bottles (250 ml) and immediately frozen for later analysis. Ca and Sr concentrations were measured on a Jarrel Ashi (Model-Iris) Inductive Coupled Plasma analyzer with two replicates (n=3) and the mean concentration calculated. Standards were run to assure precision and accuracy of the readings.

A paired t-test ($\alpha$=0.05) was run to compare densities from 1994 with those of 1996. I also ran Pearson product moment correlations to assess the association between stream width and numbers of age-0 (<60 mm) and older cutthroat trout .

## RESULTS

During 1996, we collected a total of 1627 cutthroat trout, 20 brook trout, 9 rainbow trout and 586 sculpins. Cutthroat trout were collected in all of the 62 streams sampled. Density estimates of westslope cutthroat trout averaged 0.0425/$m^2$ (n=22) in tributaries to the North Fork of the Coeur d' Alene streams compared to 0.072/$m^2$ (n=40) in tributaries to the main Coeur d' Alene River. Highest estimated cutthroat trout density was 0.1966/$m^2$ (Bear Creek) and lowest was 0.0016/$m^2$ (Bootjack and Brett creeks). Estimated densities in Reach 1 (nearest mouth) were 0.0411/$m^2$ for all tributaries compared to 0.0575/$m^2$ and 0.0818/$m^2$ in reaches 2 and 3, respectively.

Comparison of cutthroat trout densities indicated a general pattern of decreasing abundance between 1994 and 1996 (Figure 2). In general, estimated densities of cutthroat trout from streams that were higher in 1994 were also higher in 1996 although variation was wide. Substantial decreases in density from 1994 to 1996 were found in Big Hank, Buckskin, Cabin, E. Fork of Steamboat, Lost Fork, Mosquito, Rampike, Teddy, the Upper Coeur d' Alene, and Upper Jordan whereas substantial increases in density were found only in Bear Creek. Differences in cutthroat trout densities were highly significantly different between 1994 and 1996 ($t=4.54$, $df=38$, $p=0.0001$). Numbers of cutthroat trout longer than 60 mm were not significantly correlated with wetted stream width at either the stream ($r=0.02$; $df=44$), reach ($r=0.04$; $df=136$) or site ($r=0.032$; $df=408$) level.

Lengths of cutthroat trout generally showed a predominance of fish 76-175 mm (Appendix Figure 1). Modal lengths varied among streams but were generally in the 26-50 mm, 76-100 mm and 101-125 mm length classes. In general, no length classes were missing from the 1996 collections throughout the various streams. Lengths of cutthroat trout generally displayed a normal distribution in streams where larger numbers were collected.

Number of cutthroat trout <60 mm collected during our surveys varied among streams and ranged from 0 in several streams to 51 in Rampike Creek (Table 1). Twenty cutthroat trout <60 mm, the largest number collected from any one stream, were collected from Teddy Creek. The distribution of cutthroat trout < 60 mm within a stream also varied among streams. In most streams, highest numbers of cutthroat trout < 60 mm were either found in the two lower stream reaches although in some streams the age 0 cutthroat trout were collected in the upstream sections. I found a weak but significant correlation ($p<0.05$) between numbers of age-0 cutthroat trout and wetted width at the site ($r=0.12$; $df=408$), but not at the reach ($r=0.15$; $df=136$), and stream levels ($r=0.13$; $df=44$). Also, numbers of cutthroat trout less than 60 mm collected were significantly correlated with numbers of those larger than 60 mm at the site ($r=0.179$; $df=441$), but not at the reach ($r=0.12$; $df=147$), and stream levels ($r=0.15$; $df=46$).

A number of methods are available to assess phenotypic diversity in fishes. Scale analysis has been used to compare growth, longevity, size and age at maturity. Extensive tagging programs to assess distribution and infer life history strategies (fluvial and adfluvial vs. resident) have been used. These methods require extensive collecting on spawning areas although the timing of spawning often coincides with difficult sampling conditions of high discharge.

Results from the Sr and Ca analyses indicate rather wide differences in elemental Ca and Sr among streams (Table 2). The highest concentrations of elemental calcium and strontium were detected in the Coeur d' Alene River.

## DISCUSSION

We found differences in cutthroat trout densities in streams sampled in 1994 and 1996 suggesting the 1996 spring floods possibly had a deleterious effect on the westslope cutthroat trout population in the Coeur d' Alene basin. Densities of westslope cutthroat trout in 10 selected streams (Big Hank, Buckskin, Cabin, E. Fork of Steamboat, Lost Fork, Mosquito, Rampike, Teddy, the Upper Coeur d' Alene, and Upper Jordan) showed substantial decreases from 1994 whereas densities were substantially higher in 1996 than in 1994 in one stream (Bear Creek). Interestingly, all of these were tributaries of the main Coeur d' Alene River. A comparison of flows between 1994 and 1996 indicate flows in winter 1993/spring1994 were rather low compared to those in 1996. Flows in 1994 in the Coeur d' Alene River (Cataldo USGS Station-12413500) peaked near 9,000 cfs (254.8 $m^3/s$) compared to those in 1996 at 56,000 cfs (1585.8 $m^3/s$) whereas those in 1995 were intermediate (Figure 3). Our data suggests high flows in February 1996 may have had a deleterious effect on westslope cutthroat trout densities in the Coeur d' Alene basin. However, we found overall no missing length classes or portions of the length distributions missing from cutthroat trout sampled from the various streams.

I anticipated that if high discharge adversely affected the westslope cutthroat trout population in the Coeur d' Alene basin, the 1995 year-class (age 1) probably would have been the most vulnerable. The length data does not support this hypothesis that the youngest age class would be the most vulnerable to the high discharge. Regardless, the disproportionate number of streams that showed decreases in density from 1994 to 1996 suggest the high discharges probably adversely affected the abundance of westslope cutthroat trout.

Distribution of westslope cutthroat trout <60 mm was highly variable throughout the drainage. We collected westslope cutthroat trout <60 mm in 39 streams. I consider collection of cutthroat trout < 60 mm a conservative estimate of spawning distribution as smaller fish are often not collected by electrofishing because of their smaller surface area (Reynolds 1983). Brett Creek, a tributary of the main Coeur d' Alene River, was one stream where these smaller cutthroat trout were not collected. Interestingly, in early 1994, total cutthroat trout densities were estimated at $0.035/m^2$, later that summer they were estimated at $0.128/m^2$, whereas in 1995 they were $0.0456/m^2$ compared to $0.0016/m^2$ in 1996. I do not know why the densities were substantially different but the low abundance of spawning fish may have been related. However, I found no significant correlation between numbers of larger cutthroat trout and numbers of age-0 cutthroat trout in the streams sampled. Bumblebee Creek was another tributary where no westslope cutthroat trout < 60 mm were collected and trends in numbers were similar to those in Brett Creek. Similar declines in subadult/adult abundance were found from 1994 through 1996. In 1994 density was estimated at $0.0790/m^2$, in 1995 at $0.0141/m^2$ and in 1996 at $0.0091/m^2$. Additional years of sampling would be beneficial to determine if the trends in population abundance continued down although it is unlikely these differences in density and the paucity of cutthroat trout < 60 mm could be attributed to chance. The current data set is inadequate to explain why the trend in numbers has been exclusively down.

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# Coeur d' Alene River Basin

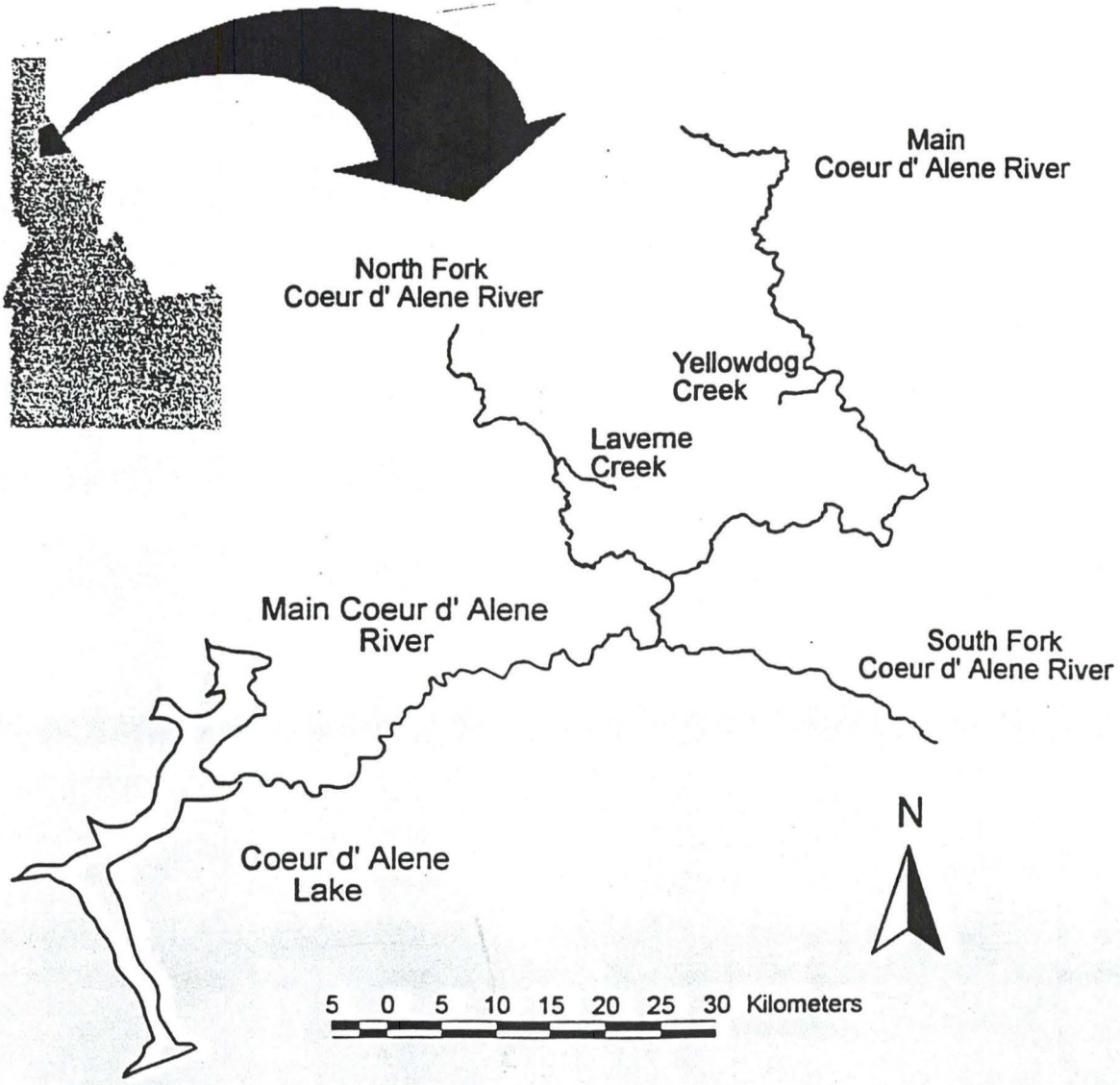



Figure 1. Study area upstream from the confluence of the North Fork of the Coeur d' Alene and main Coeur d' Alene rivers encompassing approximately 2,280 $km^2$.

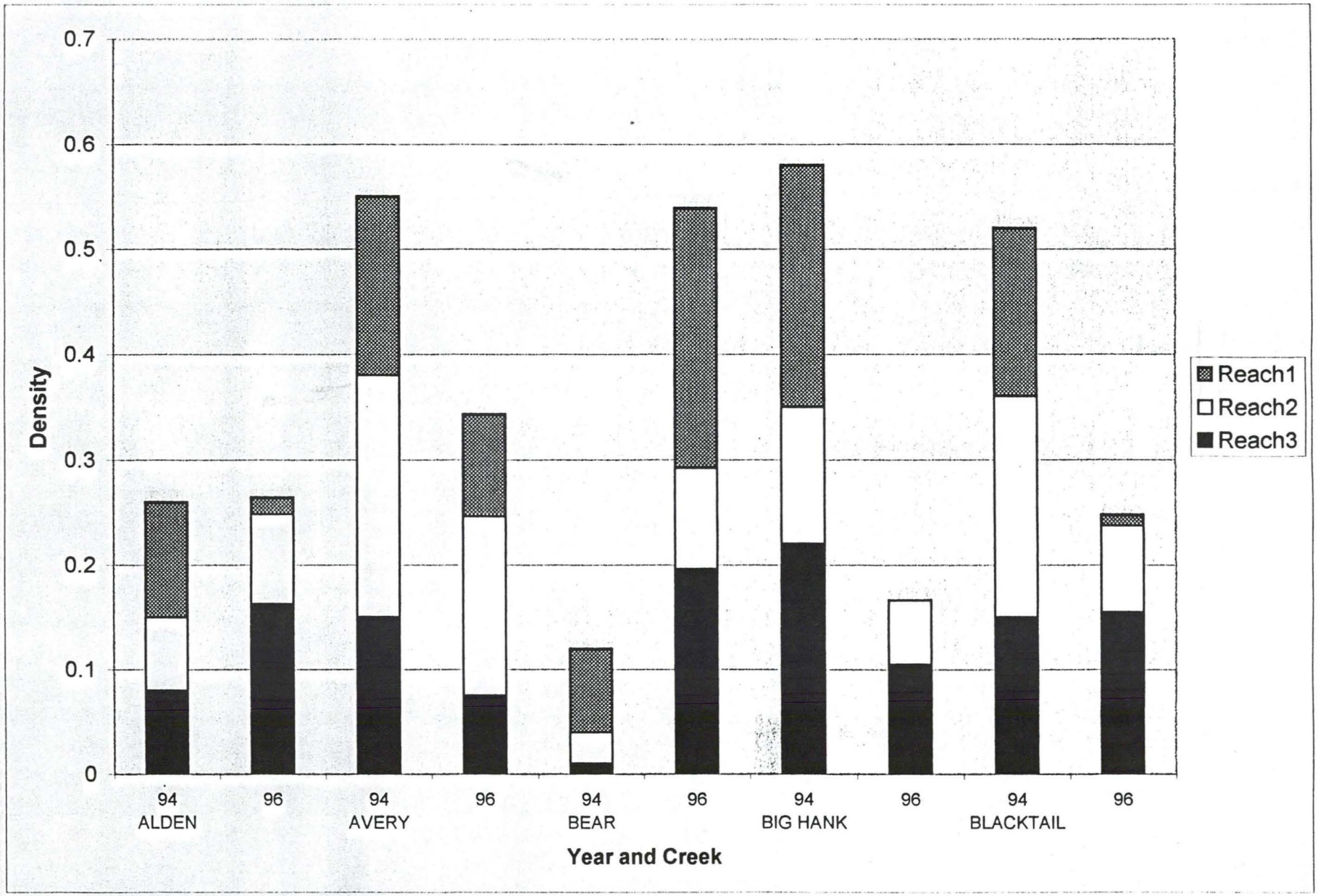
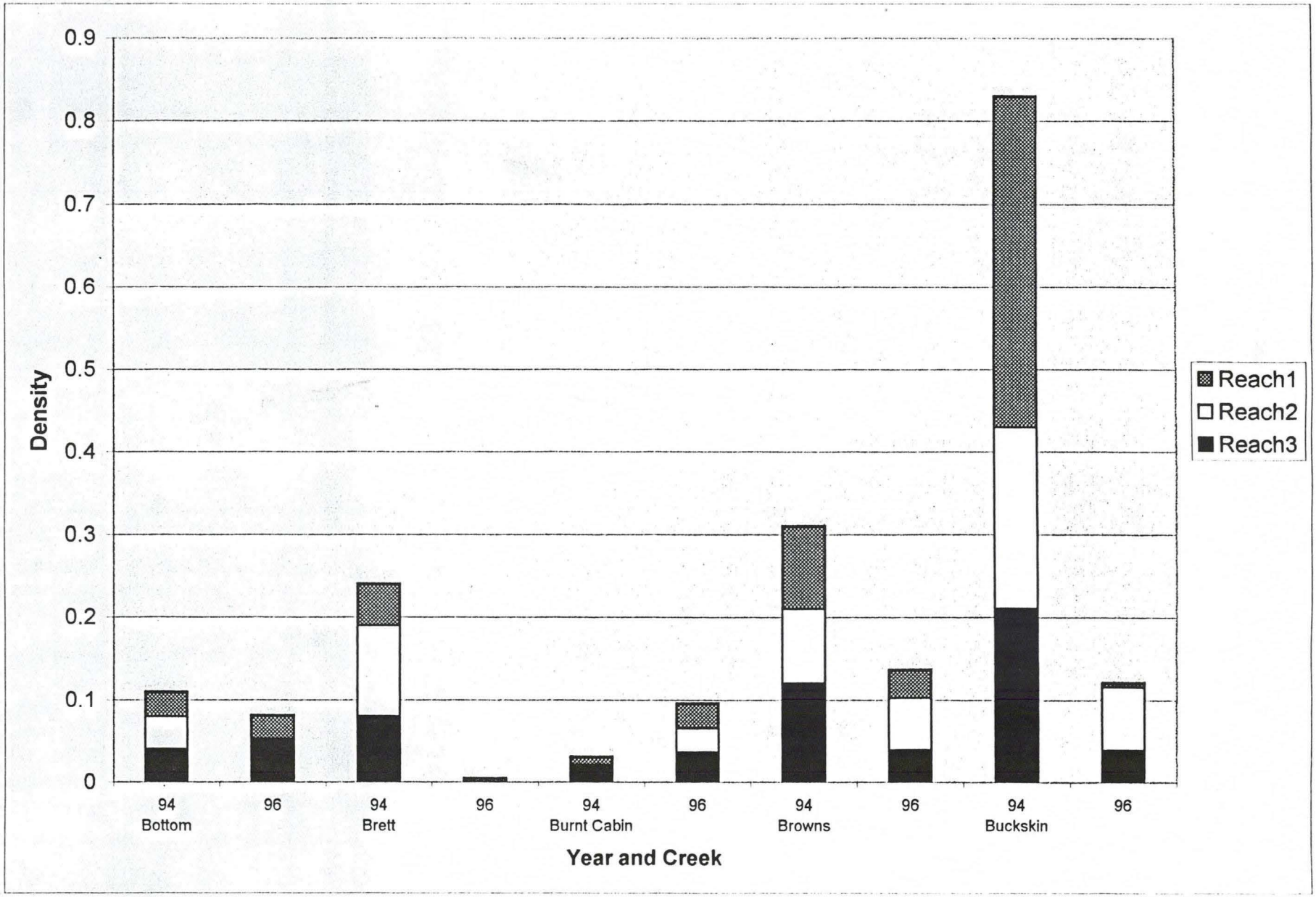



Figure 2. Comparison of estimated densities of westslope cutthroat trout (>60 mm) between 1994 and 1996 in three reaches of tributaries in the Coeur d'Alene drainage. Streams were divided into three reaches of equal length and densities within each reach projected from the mean of three – 30 m single electrofishing passes and catches adjusted for sampling efficiency.

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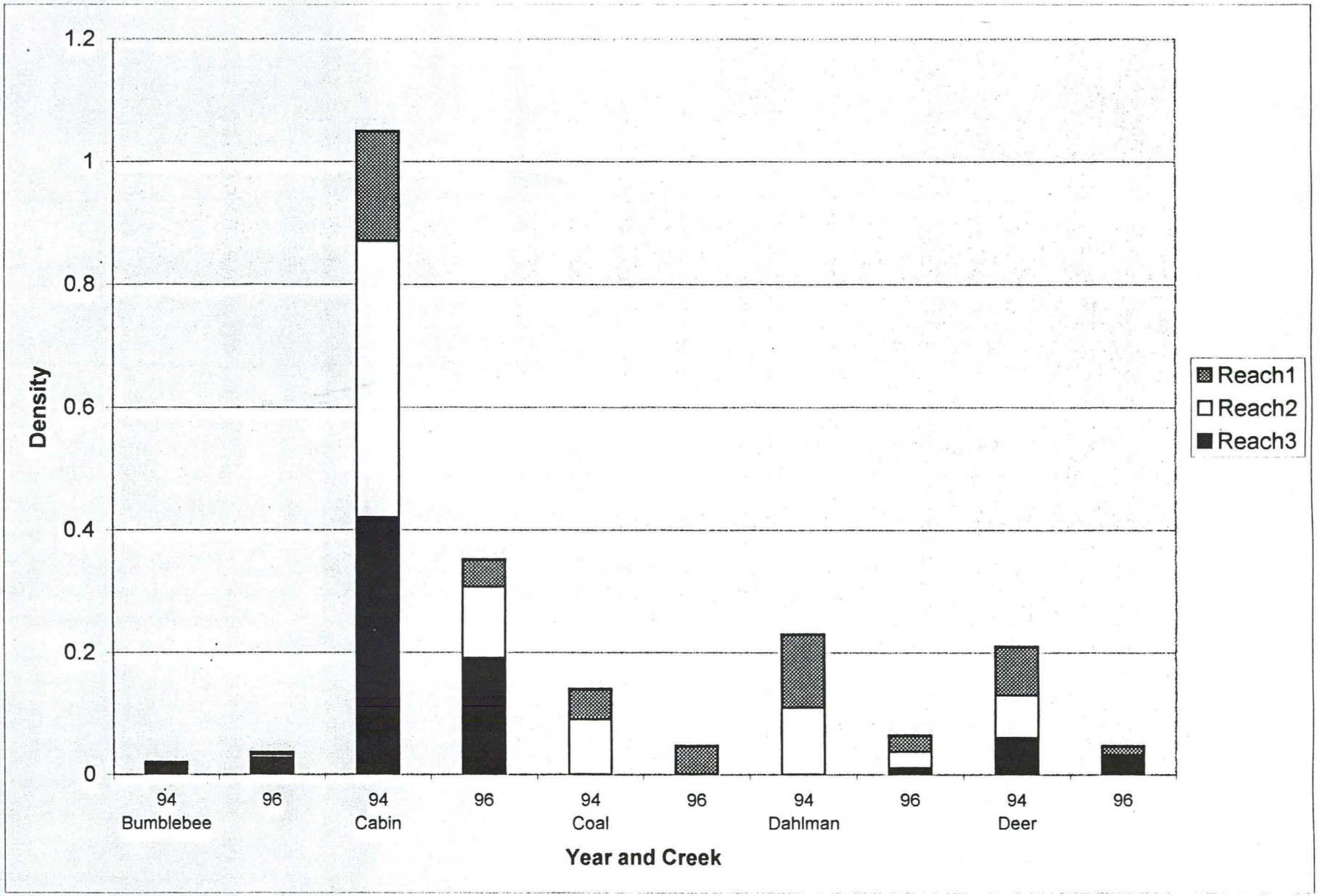


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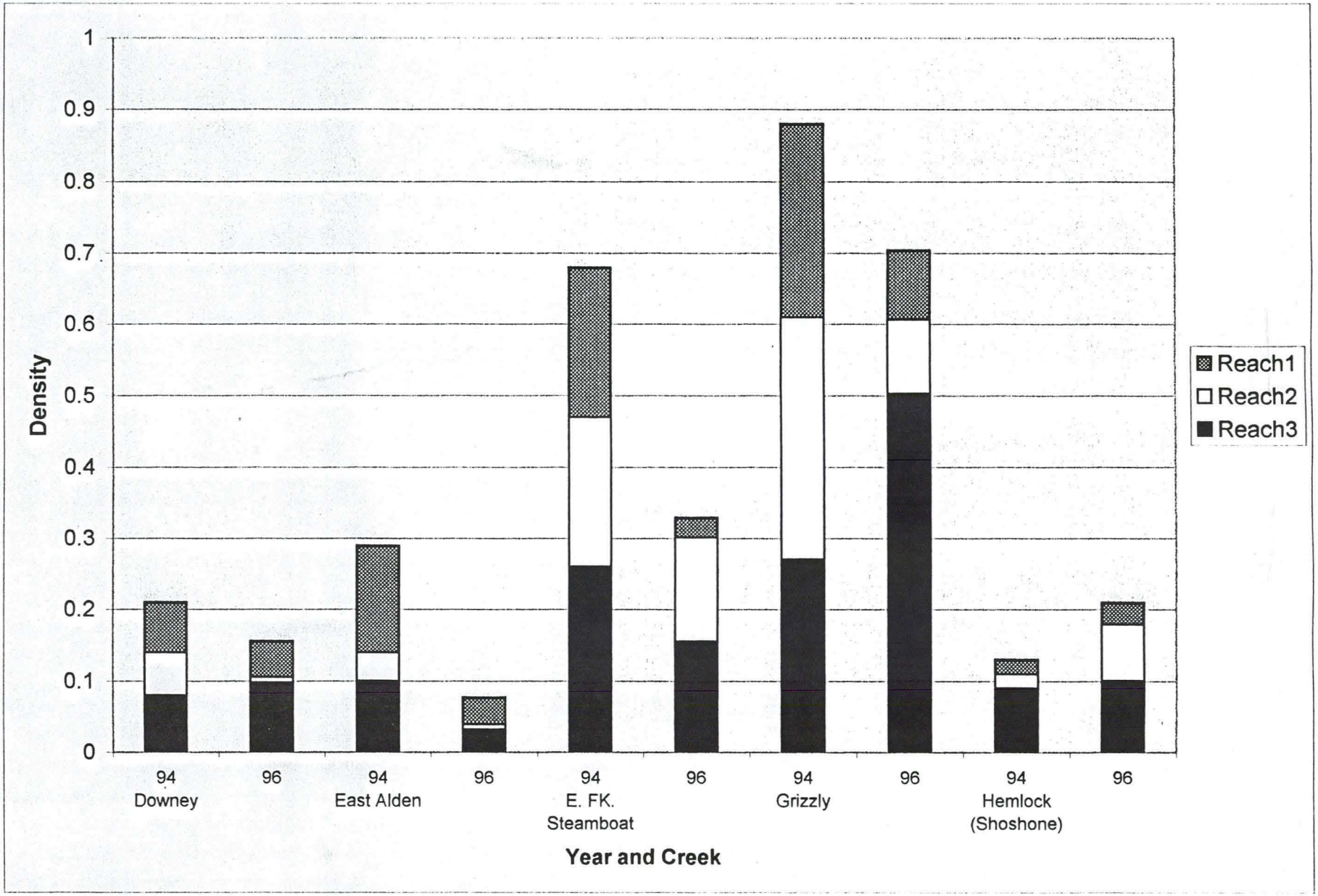


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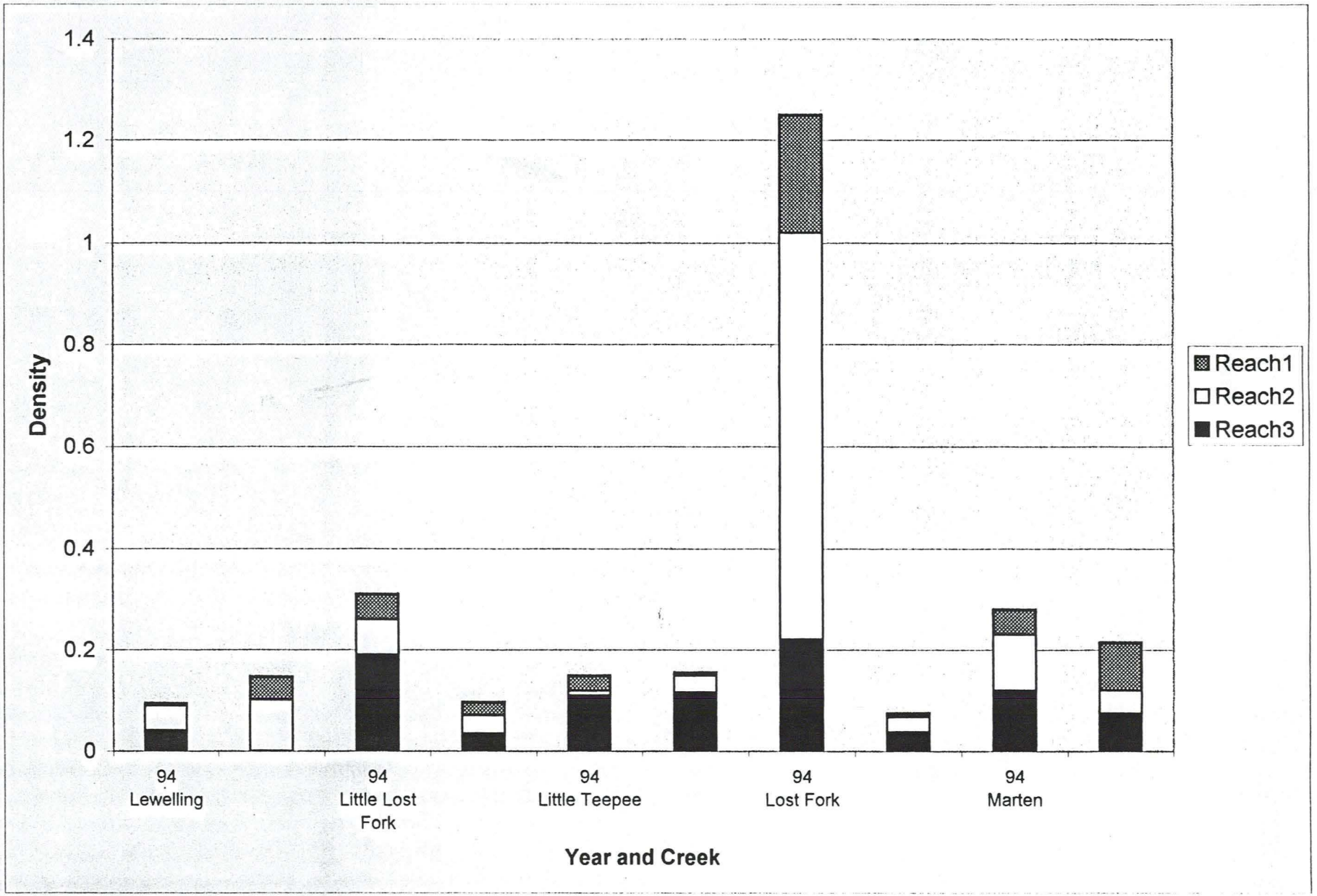


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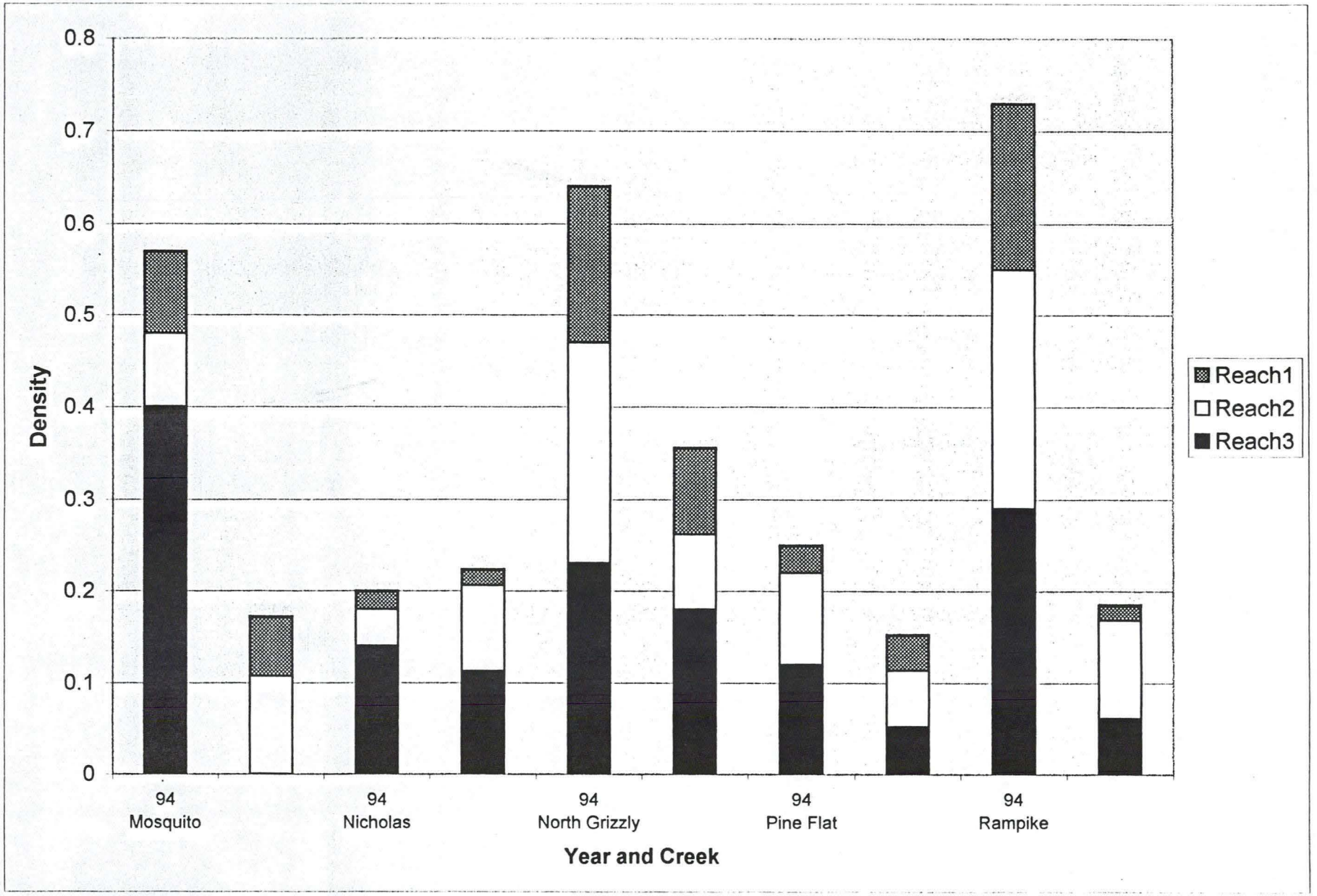


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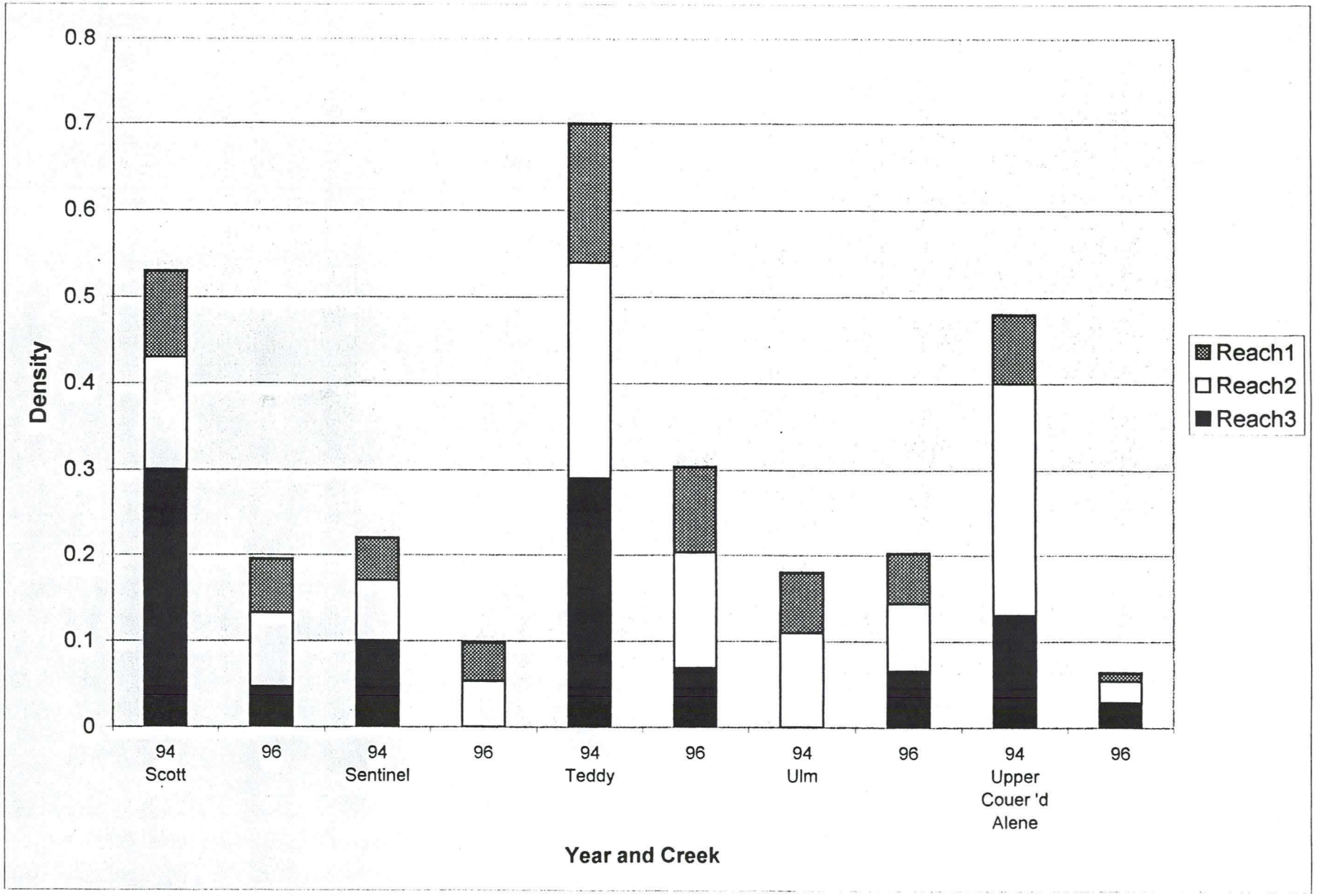


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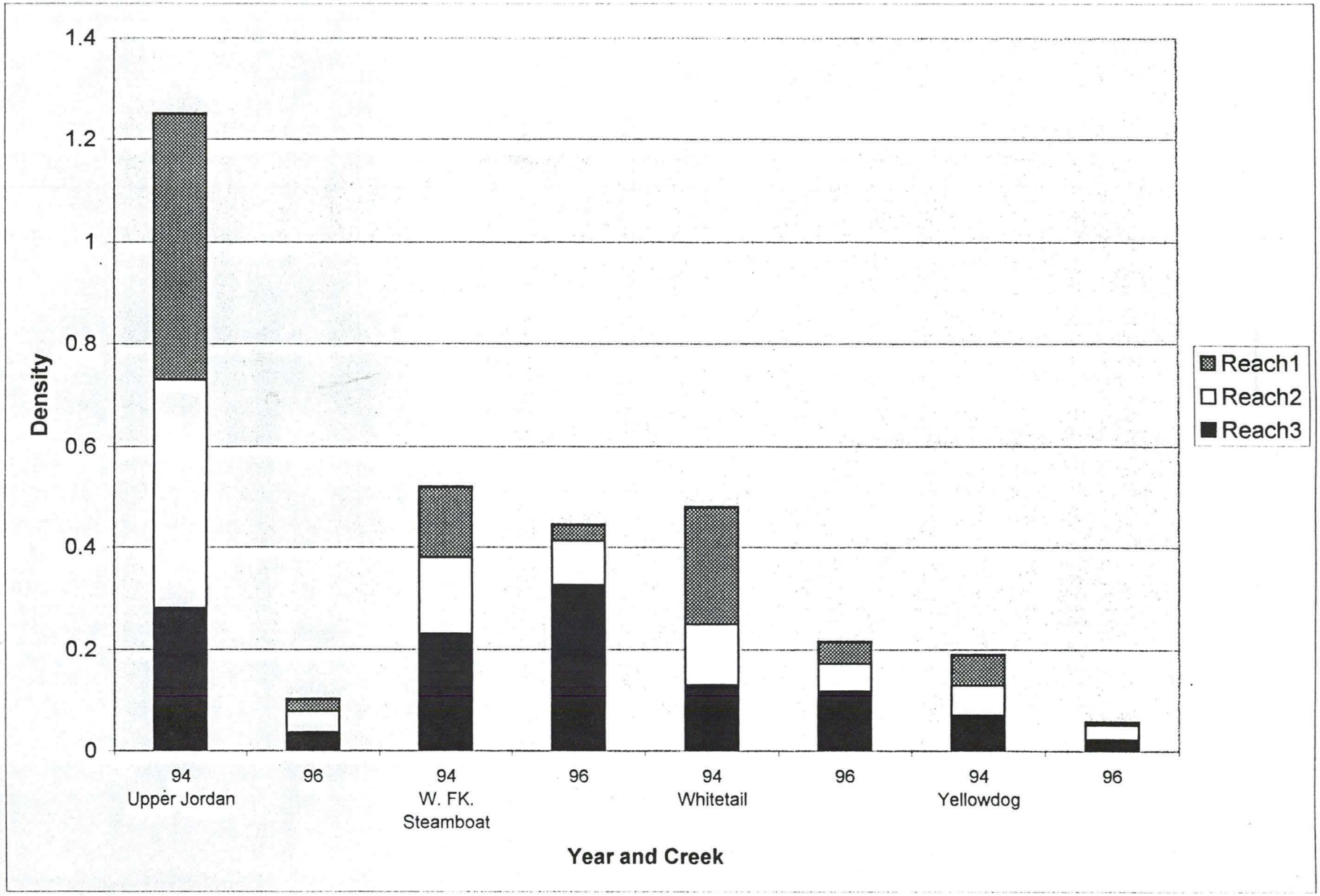


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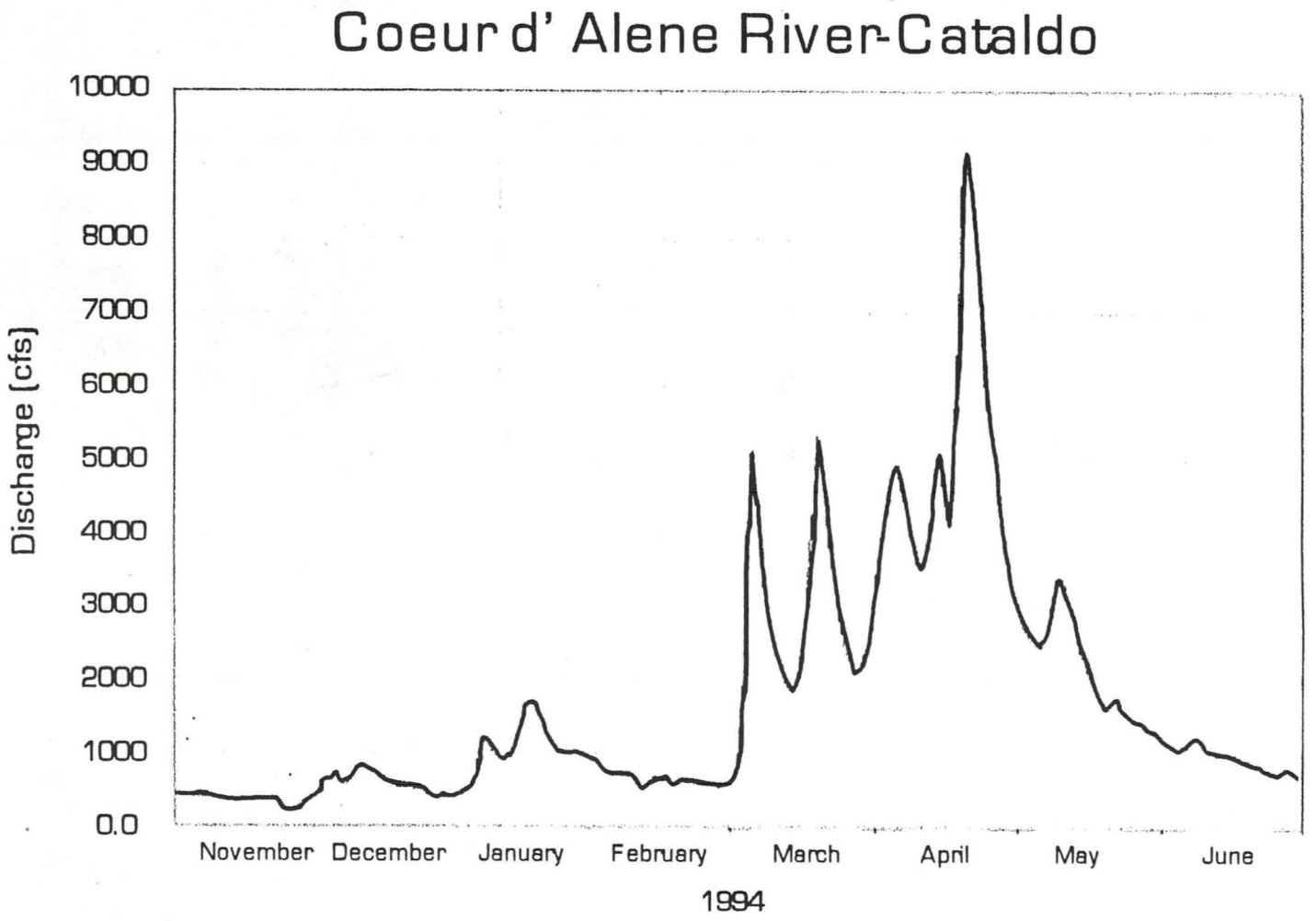
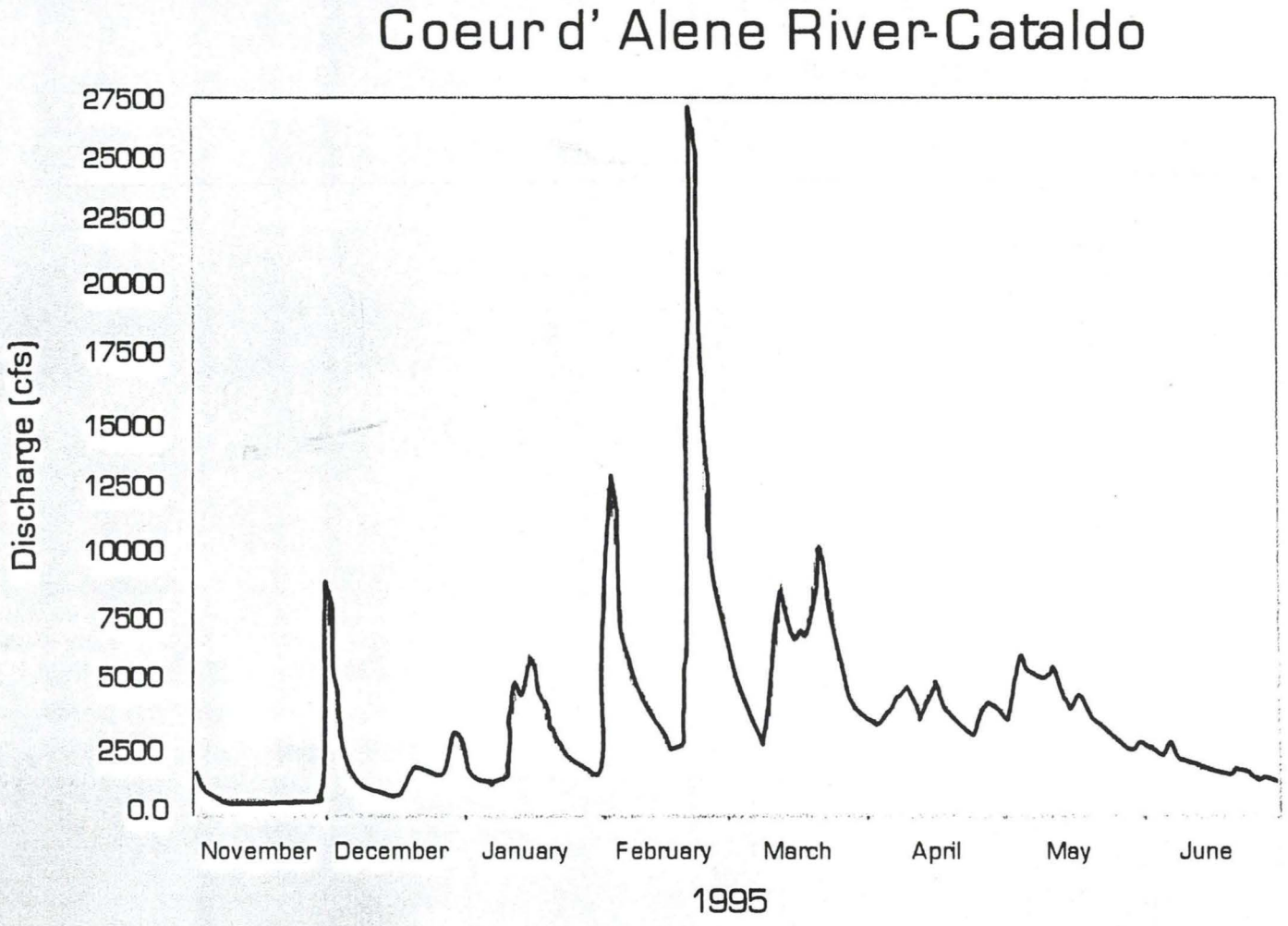



Figure 3. Hydrographs for the Coeur d' Alene River (Cataldo), Idaho for 1994, 1995 and 1996.

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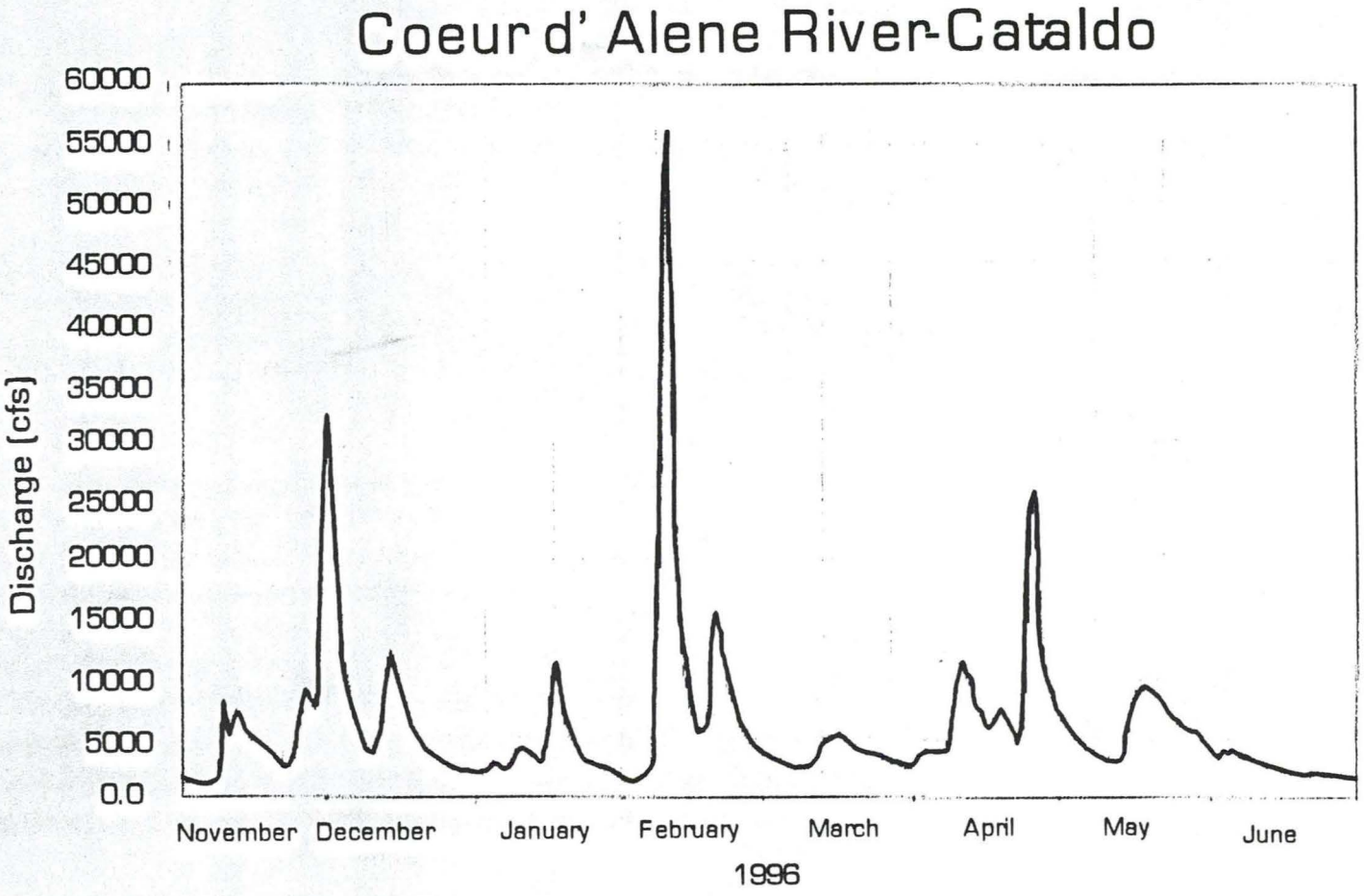



Figure 3. Continued

Table 1. Numbers of age 0 (<60 mm) and older (>60 mm) westslope cutthroat trout (ct) collected from various streams, reaches and sites within the Coeur d'Alene basin in 1996. Also shown is the wetted width of the streams and date of collection.

| STREAM | REACH | SITE | DATE | WETTED WIDTH | CT > 60 | CT <= 60 | CT <= 50 | CT <= 40 | CT TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| ALDEN CREEK | 1 | 1 | 09/10/96 | 9.666667 | 1 | 0 | 0 | 0 | 1 |
| | | 2 | 09/10/96 | 5.444444 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 09/10/96 | 5.444444 | 2 | 0 | 0 | 0 | 2 |
| | 2 | 1 | 09/10/96 | 5 | 0 | 1 | 1 | 0 | 1 |
| | | 2 | 09/10/96 | 6.666667 | 4 | 0 | 0 | 0 | 4 |
| | | 3 | 09/10/96 | 4.666667 | 11 | 0 | 0 | 0 | 11 |
| | 3 | 1 | 09/10/96 | 4.111111 | 9 | 0 | 0 | 0 | 9 |
| | | 2 | 09/10/96 | 4.888889 | 5 | 0 | 0 | 0 | 5 |
| | | 3 | 09/10/96 | 4.111111 | 4 | 0 | 0 | 0 | 4 |
| AVERY CREEK | 1 | 1 | 08/06/96 | 2.433333 | 1 | 0 | 0 | 0 | 1 |
| | | 2 | 08/06/96 | 2.333333 | 9 | 0 | 0 | 0 | 9 |
| | | 3 | 08/06/96 | 1.805556 | 2 | 0 | 0 | 0 | 2 |
| | 2 | 1 | 08/06/96 | 2.555556 | 7 | 0 | 0 | 0 | 7 |
| | | 2 | 08/06/96 | 1.944444 | 5 | 1 | 0 | 0 | 6 |
| | | 3 | 08/06/96 | 1.444444 | 6 | 0 | 0 | 0 | 6 |
| | 3 | 1 | 08/06/96 | 1.466667 | 1 | 0 | 0 | 0 | 1 |
| | | 2 | 08/06/96 | 2.722222 | 5 | 0 | 0 | 0 | 5 |
| | | 3 | 08/06/96 | 1.222222 | 2 | 1 | 0 | 0 | 3 |
| BARNEY CREEK | 1 | 1 | 09/16/96 | 3.222222 | 2 | 0 | 0 | 0 | 2 |
| | | 2 | 09/16/96 | 2.333333 | 1 | 1 | 0 | 0 | 2 |
| | | 3 | 09/16/96 | 3 | 2 | 0 | 0 | 0 | 2 |
| | 2 | 1 | 09/16/96 | 2.555556 | 2 | 0 | 0 | 0 | 2 |
| | | 2 | 09/16/96 | 1.777778 | 0 | 2 | 1 | 0 | 2 |
| | | 3 | 09/16/96 | 1.777778 | 5 | 0 | 0 | 0 | 5 |
| | 3 | 1 | 09/16/96 | 2.222222 | 1 | 0 | 0 | 0 | 1 |
| | | 2 | 09/16/96 | 2.666667 | 6 | 1 | 0 | 0 | 7 |
| | | 3 | 09/16/96 | 1.666667 | 1 | 0 | 0 | 0 | 1 |

Table 1. Continued

| STREAM | REACH | SITE | DATE | WETTED WIDTH | CT > 60 | CT <= 60 | CT <= 50 | CT <= 40 | CT TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| BEAR CREEK | 1 | 1 | 09/29/96 | 2.333333 | 3 | 0 | 0 | 0 | 3 |
| | | 2 | 09/29/96 | 2.666667 | 12 | 9 | 0 | 0 | 21 |
| | | 3 | 09/29/96 | 1.333333 | 10 | 4 | 0 | 0 | 14 |
| | 2 | 1 | 09/29/96 | 1.555556 | 6 | 0 | 0 | 0 | 6 |
| | | 2 | 09/29/96 | 3.111111 | 2 | 3 | 0 | 0 | 5 |
| | | 3 | 09/29/96 | 2 | 1 | 3 | 1 | 0 | 4 |
| | 3 | 1 | 09/29/96 | 1.444444 | 4 | 0 | 0 | 0 | 4 |
| | | 2 | 09/29/96 | 3.111111 | 7 | 0 | 0 | 0 | 7 |
| | | 3 | 09/29/96 | 1.888889 | 11 | 2 | 0 | 0 | 13 |
| BIG ELK | 1 | 1 | 08/06/96 | 4.1 | 3 | 0 | 0 | 0 | 3 |
| | | 2 | 08/06/96 | 3.1 | 2 | 0 | 0 | 0 | 2 |
| | | 3 | 08/06/96 | 4 | 1 | 0 | 0 | 0 | 1 |
| | 2 | 1 | 08/06/96 | 3.4 | 3 | 2 | 1 | 1 | 5 |
| | | 2 | 08/06/96 | 3.7 | 2 | 2 | 2 | 2 | 4 |
| | | 3 | 08/06/96 | 3.6 | 0 | 2 | 2 | 1 | 2 |
| | 3 | 1 | 08/06/96 | 2.1 | 2 | 0 | 0 | 0 | 2 |
| | | 2 | 08/06/96 | 3.2 | 3 | 0 | 0 | 0 | 3 |
| | | 3 | 08/06/96 | 4.12 | 6 | 0 | 0 | 0 | 6 |
| BIG HANK CREEK | 1 | 1 | 09/27/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| | | 2 | 09/27/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 09/27/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| | 2 | 1 | 09/27/96 | 2 | 0 | 1 | 1 | 0 | 1 |
| | | 2 | 09/27/96 | 3.444444 | 4 | 1 | 1 | 0 | 5 |
| | | 3 | 09/27/96 | 1.777778 | 4 | 0 | 0 | 0 | 4 |
| | 3 | 1 | 09/27/96 | 4.222222 | 10 | 0 | 0 | 0 | 10 |
| | | 2 | 09/27/96 | 1.555556 | 3 | 0 | 0 | 0 | 3 |
| | | 3 | 09/27/96 | 1.333333 | 2 | 0 | 0 | 0 | 2 |

Table 1. Continued

| STREAM | REACH | SITE | DATE | WETTED WIDTH | CT > 60 | CT <= 60 | CT <= 50 | CT <= 40 | CT TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| BLACKTAIL CREEK | 1 | 1 | 09/07/96 | 6.111111 | 2 | 0 | 0 | 0 | 2 |
| | | 2 | 09/07/96 | 3.888889 | 1 | 1 | 0 | 0 | 2 |
| | | 3 | 09/07/96 | 1.333333 | 0 | 0 | 0 | 0 | 0 |
| | 2 | 1 | 09/07/96 | 3 | 8 | 0 | 0 | 0 | 8 |
| | | 2 | 09/07/96 | 2.388889 | 2 | 0 | 0 | 0 | 2 |
| | | 3 | 09/07/96 | 1.888889 | 2 | 0 | 0 | 0 | 2 |
| | 3 | 1 | 09/07/96 | 2.666667 | 10 | 0 | 0 | 0 | 10 |
| | | 2 | 09/07/96 | 2.222222 | 7 | 0 | 0 | 0 | 7 |
| | | 3 | 09/07/96 | 3 | 5 | 0 | 0 | 0 | 5 |
| BOTTOM CREEK | 1 | 1 | 07/11/96 | 2.333333 | 2 | 0 | 0 | 0 | 2 |
| | | 2 | 07/11/96 | 2.888889 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 07/11/96 | 2.777778 | 2 | 0 | 0 | 0 | 2 |
| | 2 | 1 | 07/11/96 | 2.888889 | 0 | 0 | 0 | 0 | 0 |
| | | 2 | 07/11/96 | 8.666667 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 07/11/96 | 2 | 0 | 0 | 0 | 0 | 0 |
| | 3 | 1 | 07/11/96 | 4.555556 | 2 | 1 | 0 | 0 | 3 |
| | | 2 | 07/11/96 | 3 | 2 | 0 | 0 | 0 | 2 |
| | | 3 | 07/11/96 | 2.777778 | 5 | 0 | 0 | 0 | 5 |
| BRETT CREEK | 1 | 1 | 07/10/96 | 4 | 1 | 0 | 0 | 0 | 1 |
| | | 2 | 07/10/96 | 3.111111 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 07/10/96 | 2.777778 | 0 | 0 | 0 | 0 | 0 |
| | 2 | 1 | 07/10/96 | 2.555556 | 0 | 0 | 0 | 0 | 0 |
| | | 2 | 07/10/96 | 3.222222 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 07/10/96 | 2.888889 | 0 | 0 | 0 | 0 | 0 |
| | 3 | 1 | 07/10/96 | 2.555556 | 0 | 0 | 0 | 0 | 0 |
| | | 2 | 07/10/96 | 2.666667 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 07/10/96 | 3.333333 | 0 | 0 | 0 | 0 | 0 |

Table 1. Continued

| STREAM | REACH | SITE | DATE | WETTED WIDTH | CT > 60 | CT <= 60 | CT <= 50 | CT <= 40 | CT TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| BURNT CABIN CREEK | 1 | 1 | 09/13/96 | 3.222222 | 2 | 0 | 0 | 0 | 2 |
| | | 2 | 09/13/96 | 5.888889 | 4 | 1 | 0 | 0 | 5 |
| | | 3 | 09/13/96 | 5 | 2 | 2 | 1 | 0 | 4 |
| | 2 | 1 | 09/13/96 | 3 | 4 | 0 | 0 | 0 | 4 |
| | | 2 | 09/13/96 | 4 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 09/13/96 | 3.333333 | 1 | 0 | 0 | 0 | 1 |
| | 3 | 1 | 09/13/96 | 5 | 0 | 4 | 3 | 0 | 4 |
| | | 2 | 09/13/96 | 5.666667 | 6 | 8 | 5 | 0 | 14 |
| | | 3 | 09/13/96 | 3.222222 | 3 | 9 | 6 | 1 | 12 |
| BROWNS CREEK | 1 | 1 | 08/06/96 | 5 | 2 | 3 | 3 | 2 | 5 |
| | | 2 | 08/06/96 | 3.333333 | 1 | 0 | 0 | 0 | 1 |
| | | 3 | 08/06/96 | 3.333333 | 4 | 0 | 0 | 0 | 4 |
| | 2 | 1 | 08/06/96 | 4 | 7 | 2 | 2 | 0 | 9 |
| | | 2 | 08/06/96 | 3.333333 | 4 | 0 | 0 | 0 | 4 |
| | | 3 | 08/06/96 | 3.333333 | 2 | 0 | 0 | 0 | 2 |
| | 3 | 1 | 08/06/96 | 2.333333 | 2 | 0 | 0 | 0 | 2 |
| | | 2 | 08/06/96 | 2.333333 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 08/06/96 | 2.333333 | 3 | 2 | 2 | 2 | 5 |
| BUCKSKIN CREEK | 1 | 1 | 08/28/96 | 3.333333 | 1 | 1 | 1 | 1 | 2 |
| | | 2 | 08/28/96 | 2.222222 | 0 | 1 | 1 | 0 | 1 |
| | | 3 | 08/28/96 | 3.444444 | 0 | 1 | 1 | 0 | 1 |
| | 2 | 1 | 08/28/96 | 2.888889 | 0 | 2 | 2 | 1 | 2 |
| | | 2 | 08/28/96 | 1.555556 | 6 | 1 | 1 | 1 | 7 |
| | | 3 | 08/28/96 | 2.333333 | 1 | 5 | 5 | 5 | 6 |
| | 3 | 1 | 08/28/96 | 3 | 2 | 0 | 0 | 0 | 2 |
| | | 2 | 08/28/96 | 3.222222 | 2 | 0 | 0 | 0 | 2 |
| | | 3 | 08/28/96 | 2.333333 | 2 | 0 | 0 | 0 | 2 |

Table 1. Continued

| STREAM | REACH | SITE | DATE | WETTED WIDTH | CT > 60 | CT <= 60 | CT <= 50 | CT <= 40 | CT TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| BUMBLEBEE CREEK | 1 | 1 | 07/12/96 | 4.666667 | 1 | 0 | 0 | 0 | 1 |
| | | 2 | 07/12/96 | 3.111111 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 07/12/96 | 4.777778 | 0 | 0 | 0 | 0 | 0 |
| | 2 | 1 | 07/12/96 | 4 | 0 | 0 | 0 | 0 | 0 |
| | | 2 | 07/12/96 | 3.333333 | 1 | 0 | 0 | 0 | 1 |
| | | 3 | 07/12/96 | 3.888889 | 0 | 0 | 0 | 0 | 0 |
| | 3 | 1 | 07/12/96 | 2.444444 | 2 | 0 | 0 | 0 | 2 |
| | | 2 | 07/12/96 | 2.888889 | 2 | 0 | 0 | 0 | 2 |
| | | 3 | 07/12/96 | 3.222222 | 0 | 0 | 0 | 0 | 0 |
| CABIN CREEK | 1 | 1 | 08/06/96 | 3.733333 | 3 | 0 | 0 | 0 | 3 |
| | | 2 | 08/06/96 | 4.533333 | 2 | 1 | 1 | 0 | 3 |
| | | 3 | 08/06/96 | 3.3 | 4 | 0 | 0 | 0 | 4 |
| | 2 | 1 | 08/06/96 | 3.7 | 5 | 0 | 0 | 0 | 5 |
| | | 2 | 08/06/96 | 3.166667 | 4 | 0 | 0 | 0 | 4 |
| | | 3 | 08/06/96 | 2.333333 | 9 | 0 | 0 | 0 | 9 |
| | 3 | 1 | 08/06/96 | 2.666667 | 11 | 0 | 0 | 0 | 11 |
| | | 2 | 08/06/96 | 3.433333 | 9 | 0 | 0 | 0 | 9 |
| | | 3 | 08/06/96 | 2.9 | 11 | 0 | 0 | 0 | 11 |
| CLINTON CREEK | 1 | 1 | 09/28/96 | 3 | 8 | 4 | 1 | 0 | 12 |
| | | 2 | 09/28/96 | 3.333333 | 3 | 6 | 0 | 0 | 9 |
| | | 3 | 09/28/96 | 3.333333 | 3 | 0 | 0 | 0 | 3 |
| | 2 | 1 | 09/28/96 | 2.333333 | 1 | 3 | 0 | 0 | 4 |
| | | 2 | 09/28/96 | 1.888889 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 09/28/96 | 2 | 1 | 0 | 0 | 0 | 1 |
| | 3 | 1 | 09/28/96 | 2.222222 | 8 | 0 | 0 | 0 | 8 |
| | | 2 | 09/28/96 | 2.222222 | 10 | 0 | 0 | 0 | 10 |
| | | 3 | 09/28/96 | 2.888889 | 4 | 6 | 6 | 0 | 10 |

Table 1. Continued

| STREAM | REACH | SITE | DATE | WETTED WIDTH | CT > 60 | CT <= 60 | CT <= 50 | CT <= 40 | CT TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| COAL CREEK | 1 | 1 | 08/07/96 | 5.5 | 4 | 0 | 0 | 0 | 4 |
| | | 2 | 08/07/96 | 3.4 | 4 | 0 | 0 | 0 | 4 |
| | | 3 | 08/07/96 | 2.8 | 2 | 0 | 0 | 0 | 2 |
| | 2 | 1 | 08/07/96 | 4.2 | 0 | 0 | 0 | 0 | 0 |
| | | 2* | 08/07/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| | | 3* | 08/07/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| | 3* | 1* | 08/07/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| | | 2* | 08/07/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| | | 3* | 08/07/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| DAHLMAN CREEK | 1 | 1 | 08/27/96 | 2.333333 | 0 | 0 | 0 | 0 | 0 |
| | | 2 | 08/27/96 | 1.444444 | 1 | 0 | 0 | 0 | 1 |
| | | 3 | 08/27/96 | 2.55 | 2 | 1 | 1 | 0 | 3 |
| | 2 | 1 | 08/27/96 | 2 | 3 | 0 | 0 | 0 | 3 |
| | | 2 | 08/27/96 | 1.777778 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 08/27/96 | 2.666667 | 0 | 0 | 0 | 0 | 0 |
| | 3 | 1 | 08/27/96 | 2.555556 | 0 | 0 | 0 | 0 | 0 |
| | | 2 | 08/27/96 | 1.666667 | 1 | 0 | 0 | 0 | 1 |
| | | 3 | 08/27/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| DEER CREEK | 1 | 1 | 09/06/96 | 4.444444 | 1 | 0 | 0 | 0 | 1 |
| | | 2 | 09/06/96 | 5.555556 | 1 | 0 | 0 | 0 | 1 |
| | | 3 | 09/06/96 | 6.444444 | 3 | 0 | 0 | 0 | 3 |
| | 2 | 1 | 09/06/96 | 4.555556 | 0 | 0 | 0 | 0 | 0 |
| | | 2 | 09/06/96 | 4.111111 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 09/06/96 | 4.666667 | 0 | 0 | 0 | 0 | 0 |
| | 3 | 1 | 09/06/96 | 3.222222 | 0 | 0 | 0 | 0 | 0 |
| | | 2 | 09/06/96 | 4.444445 | 2 | 0 | 0 | 0 | 2 |
| | | 3 | 09/06/96 | 4.666667 | 6 | 0 | 0 | 0 | 6 |

Table 1. Continued

| STREAM | REACH | SITE | DATE | WETTED WIDTH | CT > 60 | CT <= 60 | CT <= 50 | CT <= 40 | CT TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| DOWNEY CREEK | 1 | 1 | 08/06/96 | 5.8 | 2 | 2 | 2 | 2 | 4 |
| | | 2 | 08/06/96 | 3.2 | 5 | 0 | 0 | 0 | 5 |
| | | 3 | 08/06/96 | 3.5 | 3 | 0 | 0 | 0 | 3 |
| | 2 | 1 | 08/06/96 | 7.666667 | 2 | 1 | 1 | 1 | 3 |
| | | 2 | 08/06/96 | 4.933333 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 08/06/96 | 5.3 | 1 | 1 | 1 | 1 | 2 |
| | 3 | 1 | 08/06/96 | 2.5 | 6 | 0 | 0 | 0 | 6 |
| | | 2 | 08/06/96 | 3 | 3 | 0 | 0 | 0 | 3 |
| | | 3 | 08/06/96 | 2.5 | 5 | 0 | 0 | 0 | 5 |
| EAST ALDEN CREEK | 1 | 1 | 09/10/96 | 2.333333 | 3 | 0 | 0 | 0 | 3 |
| | | 2 | 09/10/96 | 2.444444 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 09/10/96 | 2.555556 | 2 | 0 | 0 | 0 | 2 |
| | 2 | 1 | 09/10/96 | 2.444444 | 1 | 0 | 0 | 0 | 1 |
| | | 2 | 09/10/96 | 1.777778 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 09/10/96 | 2.333333 | 0 | 0 | 0 | 0 | 0 |
| | 3 | 1 | 09/10/96 | 2.555556 | 2 | 1 | 1 | 1 | 3 |
| | | 2 | 09/10/96 | 1 | 1 | 0 | 0 | 0 | 1 |
| | | 3* | 09/10/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| E. FK. STEAMBOAT | 1 | 1 | 08/06/96 | 4.9 | 2 | 0 | 0 | 0 | 2 |
| | | 2 | 08/06/96 | 4.7 | 2 | 0 | 0 | 0 | 2 |
| | | 3 | 08/06/96 | 5.8 | 4 | 0 | 0 | 0 | 4 |
| | 2 | 1 | 08/06/96 | 4.15 | 23 | 1 | 1 | 1 | 24 |
| | | 2 | 08/06/96 | 5.2 | 2 | 0 | 0 | 0 | 2 |
| | | 3 | 08/06/96 | 5 | 11 | 0 | 0 | 0 | 11 |
| | 3 | 1 | 08/06/96 | 3.5 | 11 | 0 | 0 | 0 | 11 |
| | | 2 | 08/06/96 | 4.7 | 23 | 0 | 0 | 0 | 23 |
| | | 3 | 08/06/96 | 3.7 | 2 | 0 | 0 | 0 | 2 |

Table 1. Continued

| STREAM | REACH | SITE | DATE | WETTED WIDTH | CT > 60 | CT <= 60 | CT <= 50 | CT <= 40 | CT TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| GRIZZLY CREEK | 1 | 1 | 08/07/96 | 6.9 | 14 | 0 | 0 | 0 | 14 |
| | | 2 | 08/07/96 | 3.8 | 6 | 0 | 0 | 0 | 6 |
| | | 3 | 08/07/96 | 3.9 | 7 | 0 | 0 | 0 | 7 |
| | 2 | 1 | 08/07/96 | 3.2 | 3 | 0 | 0 | 0 | 3 |
| | | 2 | 08/07/96 | 3 | 7 | 0 | 0 | 0 | 7 |
| | | 3 | 08/07/96 | 4.4 | 11 | 7 | 7 | 4 | 18 |
| | 3 | 1 | 08/07/96 | 1.5 | 23 | 0 | 0 | 0 | 23 |
| | | 2 | 08/07/96 | 1.5 | 14 | 0 | 0 | 0 | 14 |
| | | 3 | 08/07/96 | 3.2 | 10 | 0 | 0 | 0 | 10 |
| HALSEY | 1 | 1 | 08/07/96 | 3.6 | 9 | 4 | 4 | 1 | 13 |
| | | 2 | 08/07/96 | 2.85 | 3 | 1 | 1 | 0 | 4 |
| | | 3 | 08/07/96 | 2.933333 | 3 | 1 | 1 | 1 | 4 |
| | 2 | 1 | 08/07/96 | 2.466667 | 2 | 0 | 0 | 0 | 2 |
| | | 2 | 08/07/96 | 2.222222 | 2 | 0 | 0 | 0 | 2 |
| | | 3 | 08/07/96 | 3 | 5 | 0 | 0 | 0 | 5 |
| | 3 | 1 | 08/07/96 | 2.888889 | 4 | 1 | 1 | 1 | 5 |
| | | 2 | 08/07/96 | 3.111111 | 2 | 0 | 0 | 0 | 2 |
| | | 3 | 08/07/96 | 3 | 2 | 0 | 0 | 0 | 2 |
| HEMLOCK (SHOSHONE) | 1 | 1 | 09/09/96 | 2.666667 | 1 | 0 | 0 | 0 | 1 |
| | | 2 | 09/09/96 | 3.777778 | 2 | 0 | 0 | 0 | 2 |
| | | 3 | 09/09/96 | 3.777778 | 3 | 0 | 0 | 0 | 3 |
| | 2 | 1 | 09/09/96 | 2.222222 | 3 | 0 | 0 | 0 | 3 |
| | | 2 | 09/09/96 | 3.333333 | 7 | 0 | 0 | 0 | 7 |
| | | 3 | 09/09/96 | 3.222222 | 3 | 0 | 0 | 0 | 3 |
| | 3 | 1 | 09/09/96 | 2.666667 | 6 | 0 | 0 | 0 | 6 |
| | | 2 | 09/09/96 | 2 | 3 | 0 | 0 | 0 | 3 |
| | | 3 | 09/09/96 | 2.222222 | 4 | 1 | 0 | 0 | 5 |

Table 1. Continued

| STREAM | REACH | SITE | DATE | WETTED WIDTH | CT > 60 | CT <= 60 | CT <= 50 | CT <= 40 | CT TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| HONEY CREEK | 1 | 1 | 08/12/96 | 2.888889 | 0 | 0 | 0 | 0 | 0 |
| | | 2 | 08/12/96 | 2.777778 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 08/12/96 | 2.333333 | 0 | 0 | 0 | 0 | 0 |
| | 2 | 1 | 08/12/96 | 2.444444 | 1 | 0 | 0 | 0 | 1 |
| | | 2 | 08/12/96 | 2.444444 | 1 | 1 | 1 | 1 | 2 |
| | | 3 | 08/12/96 | 2.222222 | 1 | 0 | 0 | 0 | 1 |
| | 3 | 1 | 08/12/96 | 2 | 0 | 0 | 0 | 0 | 0 |
| | | 2 | 08/12/96 | 2.444444 | 1 | 0 | 0 | 0 | 1 |
| | | 3 | 08/12/96 | 2.666667 | 0 | 0 | 0 | 0 | 0 |
| LEWELLING CREEK | 1 | 1 | 08/17/96 | 3.444444 | 1 | 0 | 0 | 0 | 1 |
| | | 2 | 08/17/96 | 2.444444 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 08/17/96 | 2.222222 | 5 | 1 | 1 | 1 | 6 |
| | 2 | 1 | 08/17/96 | 1.888889 | 3 | 0 | 0 | 0 | 3 |
| | | 2 | 08/17/96 | 5.666667 | 3 | 0 | 0 | 0 | 3 |
| | | 3 | 08/17/96 | 2 | 7 | 0 | 0 | 0 | 7 |
| | 3 | 1 | 08/17/96 | 2.222222 | 0 | 0 | 0 | 0 | 0 |
| | | 2* | 08/17/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| | | 3* | 08/17/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| LITTLE LOST FORK CREEK | 1 | 1 | 09/20/96 | 4.777778 | 3 | 0 | 0 | 0 | 3 |
| | | 2 | 09/20/96 | 2.666667 | 1 | 0 | 0 | 0 | 1 |
| | | 3 | 09/20/96 | 4.333333 | 2 | 0 | 0 | 0 | 2 |
| | 2 | 1 | 09/20/96 | 4.555556 | 4 | 1 | 1 | 1 | 5 |
| | | 2 | 09/20/96 | 4.888889 | 0 | 1 | 1 | 1 | 1 |
| | | 3 | 09/20/96 | 6 | 7 | 0 | 0 | 0 | 7 |
| | 3 | 1 | 09/20/96 | 3.888889 | 3 | 0 | 0 | 0 | 3 |
| | | 2 | 09/20/96 | 4.333333 | 4 | 0 | 0 | 0 | 4 |
| | | 3 | 09/20/96 | 5.333333 | 1 | 0 | 0 | 0 | 1 |

Table 1. Continued

| STREAM | REACH | SITE | DATE | WETTED WIDTH | CT > 60 | CT <= 60 | CT <= 50 | CT <= 40 | CT TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| LITTLE TEPEE | 1 | 1 | 09/19/96 | 3 | 0 | 0 | 0 | 0 | 0 |
| | | 2 | 09/19/96 | 2 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 09/19/96 | 2.666667 | 1 | 0 | 0 | 0 | 1 |
| | 2 | 1 | 09/19/96 | 1.833333 | 0 | 0 | 0 | 0 | 0 |
| | | 2 | 09/19/96 | 1.888889 | 2 | 0 | 0 | 0 | 2 |
| | | 3 | 09/19/96 | 2.666667 | 2 | 0 | 0 | 0 | 2 |
| | 3 | 1 | 09/19/96 | 2 | 5 | 0 | 0 | 0 | 5 |
| | | 2 | 09/19/96 | 2.222222 | 5 | 0 | 0 | 0 | 5 |
| | | 3 | 09/19/96 | 4.111111 | 7 | 0 | 0 | 0 | 7 |
| LOST FORK | 1 | 1 | 08/06/96 | 4.433333 | 0 | 0 | 0 | 0 | 0 |
| | | 2 | 08/06/96 | 4.222222 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 08/06/96 | 4.755556 | 2 | 0 | 0 | 0 | 2 |
| | 2 | 1 | 08/06/96 | 5.333333 | 3 | 0 | 0 | 0 | 3 |
| | | 2 | 08/06/96 | 4.222222 | 2 | 0 | 0 | 0 | 2 |
| | | 3 | 08/06/96 | 3.111111 | 2 | 0 | 0 | 0 | 2 |
| | 3 | 1 | 08/06/96 | 1.466667 | 1 | 0 | 0 | 0 | 1 |
| | | 2 | 08/06/96 | 1.888889 | 1 | 0 | 0 | 0 | 1 |
| | | 3 | 08/06/96 | 1.777778 | 2 | 0 | 0 | 0 | 2 |
| MARTEN CREEK | 1 | 1 | 08/30/96 | 1.222222 | 2 | 0 | 0 | 0 | 2 |
| | | 2 | 08/30/96 | 1.555556 | 3 | 0 | 0 | 0 | 3 |
| | | 3 | 08/30/96 | 2.444444 | 4 | 0 | 0 | 0 | 4 |
| | 2 | 1 | 08/30/96 | 2.333333 | 6 | 0 | 0 | 0 | 6 |
| | | 2 | 08/30/96 | 1.555556 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 08/30/96 | 2.333333 | 0 | 0 | 0 | 0 | 0 |
| | 3 | 1 | 08/30/96 | 2.333333 | 0 | 0 | 0 | 0 | 0 |
| | | 2 | 08/30/96 | 1.777 | 4 | 0 | 0 | 0 | 4 |
| | | 3 | 08/30/96 | 2.666667 | 5 | 0 | 0 | 0 | 5 |

Table 1. Continued

| STREAM | REACH | SITE | DATE | WETTED WIDTH | CT > 60 | CT <= 60 | CT <= 50 | CT <= 40 | CT TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| MF HUDLOW CREEK | 1 | 1 | 08/08/96 | 2.444444 | 0 | 0 | 0 | 0 | 0 |
| | | 2 | 08/08/96 | 2 | 3 | 0 | 0 | 0 | 3 |
| | | 3 | 08/08/96 | 2.222222 | 3 | 0 | 0 | 0 | 3 |
| | 2 | 1 | 08/08/96 | 2.777778 | 5 | 3 | 3 | 2 | 8 |
| | | 2 | 08/08/96 | 2 | 3 | 0 | 0 | 0 | 3 |
| | | 3 | 08/08/96 | 2.111111 | 2 | 0 | 0 | 0 | 2 |
| | 3 | 1 | 08/08/96 | 3.222222 | 5 | 0 | 0 | 0 | 5 |
| | | 2* | 08/08/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| | | 3* | 08/08/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| MOSQUITO CREEK | 1 | 1 | 08/25/96 | 2.222222 | 3 | 0 | 0 | 0 | 3 |
| | | 2 | 08/25/96 | 2.777778 | 5 | 0 | 0 | 0 | 5 |
| | | 3 | 08/25/96 | 2.44 | 1 | 0 | 0 | 0 | 1 |
| | 2 | 1 | 08/25/96 | 2.333333 | 1 | 0 | 0 | 0 | 1 |
| | | 2 | 08/25/96 | 1.333333 | 3 | 0 | 0 | 0 | 3 |
| | | 3 | 08/25/96 | 1.222222 | 4 | 0 | 0 | 0 | 4 |
| | 3 | 1 | 08/25/96 | 1.777778 | 0 | 0 | 0 | 0 | 0 |
| | | 2* | 08/25/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| | | 3* | 08/25/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| NICHOLAS CREEK | 1 | 1 | 09/12/96 | 2.111111 | 0 | 0 | 0 | 0 | 0 |
| | | 2 | 09/12/96 | 3.111111 | 3 | 0 | 0 | 0 | 3 |
| | | 3 | 09/12/96 | 2.666667 | 0 | 0 | 0 | 0 | 0 |
| | 2 | 1 | 09/12/96 | 1.888889 | 2 | 0 | 0 | 0 | 2 |
| | | 2 | 09/12/96 | 2 | 6 | 0 | 0 | 0 | 6 |
| | | 3 | 09/12/96 | 4.555556 | 5 | 2 | 2 | 1 | 7 |
| | 3 | 1 | 09/12/96 | 2.333333 | 2 | 0 | 0 | 0 | 2 |
| | | 2 | 09/12/96 | 1.777778 | 5 | 0 | 0 | 0 | 5 |
| | | 3 | 09/12/96 | 2.333333 | 6 | 0 | 0 | 0 | 6 |

Table 1. Continued

| STREAM | REACH | SITE | DATE | WETTED WIDTH | CT > 60 | CT <= 60 | CT <= 50 | CT <= 40 | CT TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| NORTH GRIZZLY CREEK | 1 | 1 | 10/01/96 | 4 | 3 | 0 | 0 | 0 | 3 |
| | | 2 | 10/01/96 | 3.555556 | 3 | 0 | 0 | 0 | 3 |
| | | 3 | 10/01/96 | 3.333333 | 12 | 9 | 7 | 2 | 21 |
| | 2 | 1 | 10/01/96 | 4.666667 | 3 | 8 | 5 | 0 | 11 |
| | | 2 | 10/01/96 | 2.666667 | 9 | 0 | 0 | 0 | 9 |
| | | 3 | 10/01/96 | 3.666667 | 2 | 0 | 0 | 0 | 2 |
| | 3 | 1 | 10/01/96 | 5.777778 | 13 | 1 | 1 | 0 | 14 |
| | | 2 | 10/01/96 | 2.222222 | 14 | 0 | 0 | 0 | 14 |
| | | 3 | 10/01/96 | 2.888889 | 4 | 1 | 0 | 0 | 5 |
| PINE FLAT CREEK | 1 | 1 | 07/02/96 | 5.222222 | 1 | 0 | 0 | 0 | 1 |
| | | 2 | 07/02/96 | 2.111111 | 2 | 0 | 0 | 0 | 2 |
| | | 3 | 07/02/96 | 4 | 4 | 5 | 4 | 4 | 9 |
| | 2 | 1 | 07/02/96 | 4.333333 | 2 | 0 | 0 | 0 | 2 |
| | | 2 | 07/02/96 | 3.777778 | 2 | 0 | 0 | 0 | 2 |
| | | 3 | 07/02/96 | 2.444444 | 6 | 0 | 0 | 0 | 6 |
| | 3 | 1 | 07/02/96 | 4.666667 | 5 | 0 | 0 | 0 | 5 |
| | | 2 | 07/02/96 | 2.222222 | 4 | 0 | 0 | 0 | 4 |
| | | 3* | 07/02/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| RAMPIKE CREEK | 1 | 1 | 09/06/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| | | 2 | 09/06/96 | 2.222222 | 1 | 2 | 0 | 0 | 3 |
| | | 3 | 09/06/96 | 2.666667 | 0 | 1 | 1 | 0 | 1 |
| | 2 | 1 | 09/06/96 | 3 | 14 | 9 | 4 | 0 | 23 |
| | | 2 | 09/06/96 | ~ | 6 | 14 | 14 | 6 | 20 |
| | | 3 | 09/06/96 | 6.222222 | 6 | 22 | 22 | 13 | 28 |
| | 3 | 1 | 09/06/96 | ~ | 7 | 1 | 1 | 0 | 8 |
| | | 2 | 09/06/96 | 5.111111 | 5 | 0 | 0 | 0 | 5 |
| | | 3 | 09/06/96 | 3.333333 | 8 | 2 | 2 | 2 | 10 |

Table 1. Continued

| STREAM | REACH | SITE | DATE | WETTED WIDTH | CT > 60 | CT <= 60 | CT <= 50 | CT <= 40 | CT TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| SCOTT | 1 | 1 | 08/06/96 | 1.95 | 1 | 3 | 3 | 0 | 4 |
| | | 2 | 08/06/96 | 1.85 | 3 | 1 | 1 | 0 | 4 |
| | | 3 | 08/06/96 | 2.233333 | 3 | 0 | 0 | 0 | 3 |
| | 2 | 1 | 08/06/96 | 2.366667 | 5 | 1 | 0 | 0 | 6 |
| | | 2 | 08/06/96 | 2.45 | 3 | 0 | 0 | 0 | 3 |
| | | 3 | 08/06/96 | 2.85 | 4 | 1 | 1 | 1 | 5 |
| | 3 | 1 | 08/06/96 | 1.175 | 2 | 0 | 0 | 0 | 2 |
| | | 2 | 08/06/96 | 1.088 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 08/06/96 | 1.15 | 1 | 0 | 0 | 0 | 1 |
| SENTINEL CREEK | 1 | 1 | 08/07/96 | 5.222222 | 4 | 0 | 0 | 0 | 4 |
| | | 2 | 08/07/96 | 4.888889 | 3 | 0 | 0 | 0 | 3 |
| | | 3 | 08/07/96 | 3.666667 | 4 | 0 | 0 | 0 | 4 |
| | 2 | 1 | 08/07/96 | 6.555556 | 6 | 0 | 0 | 0 | 6 |
| | | 2 | 08/07/96 | 4.622222 | 2 | 0 | 0 | 0 | 2 |
| | | 3 | 08/07/96 | 6.222222 | 10 | 0 | 0 | 0 | 10 |
| | 3* | 1* | 08/07/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| | | 2* | 08/07/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| | | 3* | 08/07/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| SOB CREEK | 1 | 1 | 08/14/96 | 2.222222 | 0 | 0 | 0 | 0 | 0 |
| | | 2 | 08/14/96 | 4.888889 | 3 | 0 | 0 | 0 | 3 |
| | | 3 | 08/14/96 | 3.555556 | 0 | 0 | 0 | 0 | 0 |
| | 2* | 1* | 08/14/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| | | 2* | 08/14/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| | | 3* | 08/14/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| | 3* | 1* | 08/14/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| | | 2* | 08/14/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| | | 3* | 08/14/96 | ~ | 0 | 0 | 0 | 0 | 0 |

Table 1. Continued

| STREAM | REACH | SITE | DATE | WETTED WIDTH | CT > 60 | CT <= 60 | CT <= 50 | CT <= 40 | CT TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| SOLITAIRE CREEK | 1 | 1 | 08/16/96 | 5.111111 | 3 | 12 | 12 | 2 | 15 |
| | | 2 | 08/16/96 | 2.444444 | 2 | 1 | 1 | 0 | 3 |
| | | 3 | 08/16/96 | 1.444444 | 2 | 0 | 0 | 0 | 2 |
| | 2 | 1 | 08/16/96 | 2.888889 | 2 | 0 | 0 | 0 | 2 |
| | | 2 | 08/16/96 | 2.777778 | 3 | 0 | 0 | 0 | 3 |
| | | 3 | 08/16/96 | 3.111111 | 0 | 2 | 2 | 2 | 2 |
| | 3 | 1 | 08/16/96 | 1.666667 | 2 | 1 | 1 | 0 | 3 |
| | | 2 | 08/16/96 | 2 | 2 | 0 | 0 | 0 | 2 |
| | | 3 | 08/16/96 | 2 | 0 | 0 | 0 | 0 | 0 |
| SPRUCE CREEK | 1* | 1* | 08/29/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| | | 2* | 08/29/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| | | 3* | 08/29/96 | ~ | 0 | 0 | 0 | 0 | 0 |
| | 2 | 1 | 08/29/96 | 5.666667 | 3 | 3 | 2 | 0 | 6 |
| | | 2 | 08/29/96 | 5.888889 | 1 | 0 | 0 | 0 | 1 |
| | | 3 | 08/29/96 | 3.333333 | 2 | 1 | 1 | 0 | 3 |
| | 3 | 1 | 08/29/96 | 3.777778 | 3 | 5 | 5 | 2 | 8 |
| | | 2 | 08/29/96 | 4.555556 | 8 | 2 | 2 | 0 | 10 |
| | | 3 | 08/29/96 | 2.888889 | 7 | 2 | 2 | 1 | 9 |
| TEDDY CREEK | 1 | 1 | 08/06/96 | 2.74 | 3 | 15 | 15 | 15 | 18 |
| | | 2 | 08/06/96 | 3.3 | 4 | 4 | 4 | 4 | 8 |
| | | 3 | 08/06/96 | 3.06 | 10 | 0 | 0 | 0 | 10 |
| | 2 | 1 | 08/06/96 | 1.98 | 7 | 0 | 0 | 0 | 7 |
| | | 2 | 08/06/96 | 1.98 | 4 | 0 | 0 | 0 | 4 |
| | | 3 | 08/06/96 | 2.1 | 4 | 1 | 1 | 1 | 5 |
| | 3 | 1 | 08/06/96 | 1.9 | 2 | 0 | 0 | 0 | 2 |
| | | 2 | 08/06/96 | 3.74 | 4 | 0 | 0 | 0 | 4 |
| | | 3 | 08/06/96 | 1.8 | 3 | 0 | 0 | 0 | 3 |

Table 1. Continued

| STREAM | REACH | SITE | DATE | WETTED WIDTH | CT > 60 | CT <= 60 | CT <= 50 | CT <= 40 | CT TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| TOM LAVIN CREEK | 1 | 1 | 08/15/96 | 3.555556 | 0 | 0 | 0 | 0 | 0 |
| | | 2 | 08/15/96 | 3.444444 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 08/15/96 | 3.111111 | 2 | 0 | 0 | 0 | 2 |
| | 2 | 1 | 08/15/96 | 2.666667 | 1 | 0 | 0 | 0 | 1 |
| | | 2 | 08/15/96 | 3.666667 | 1 | 2 | 1 | 1 | 3 |
| | | 3 | 08/15/96 | 4.111111 | 6 | 3 | 3 | 3 | 9 |
| | 3 | 1 | 08/15/96 | 3.444444 | 8 | 0 | 0 | 0 | 8 |
| | | 2 | 08/15/96 | 4.777778 | 3 | 2 | 1 | 1 | 5 |
| | | 3 | 08/15/96 | 3.111111 | 11 | 1 | 1 | 1 | 12 |
| ULM CREEK | 1 | 1 | 09/21/96 | 3.444444 | 1 | 2 | 2 | 2 | 3 |
| | | 2 | 09/21/96 | 4.777778 | 3 | 1 | 1 | 0 | 4 |
| | | 3 | 09/21/96 | 3 | 7 | 0 | 0 | 0 | 7 |
| | 2 | 1 | 09/21/96 | 2.777778 | 7 | 0 | 0 | 0 | 7 |
| | | 2 | 09/21/96 | 3.777778 | 2 | 2 | 2 | 2 | 4 |
| | | 3 | 09/21/96 | 3.888889 | 5 | 2 | 2 | 2 | 7 |
| | 3 | 1 | 09/21/96 | 4 | 7 | 2 | 2 | 1 | 9 |
| | | 2 | 09/21/96 | 1.888889 | 3 | 1 | 1 | 1 | 4 |
| | | 3 | 09/21/96 | 3.444444 | 1 | 1 | 1 | 0 | 2 |
| UPPER COUER d ALENE | 1 | 1 | 08/23/96 | 3.666667 | 2 | 0 | 0 | 0 | 2 |
| | | 2 | 08/23/96 | 3.777778 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 08/23/96 | 3.888889 | 0 | 0 | 0 | 0 | 0 |
| | 2 | 1 | 08/23/96 | 3.888889 | 2 | 1 | 1 | 0 | 3 |
| | | 2 | 08/23/96 | 4 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 08/23/96 | 3.44 | 3 | 2 | 2 | 0 | 5 |
| | 3 | 1 | 08/23/96 | 4.777778 | 3 | 1 | 1 | 1 | 4 |
| | | 2 | 08/23/96 | 2.555556 | 1 | 0 | 0 | 0 | 1 |
| | | 3 | 08/23/96 | 3.333333 | 2 | 1 | 1 | 0 | 3 |

Table [redacted] Continued

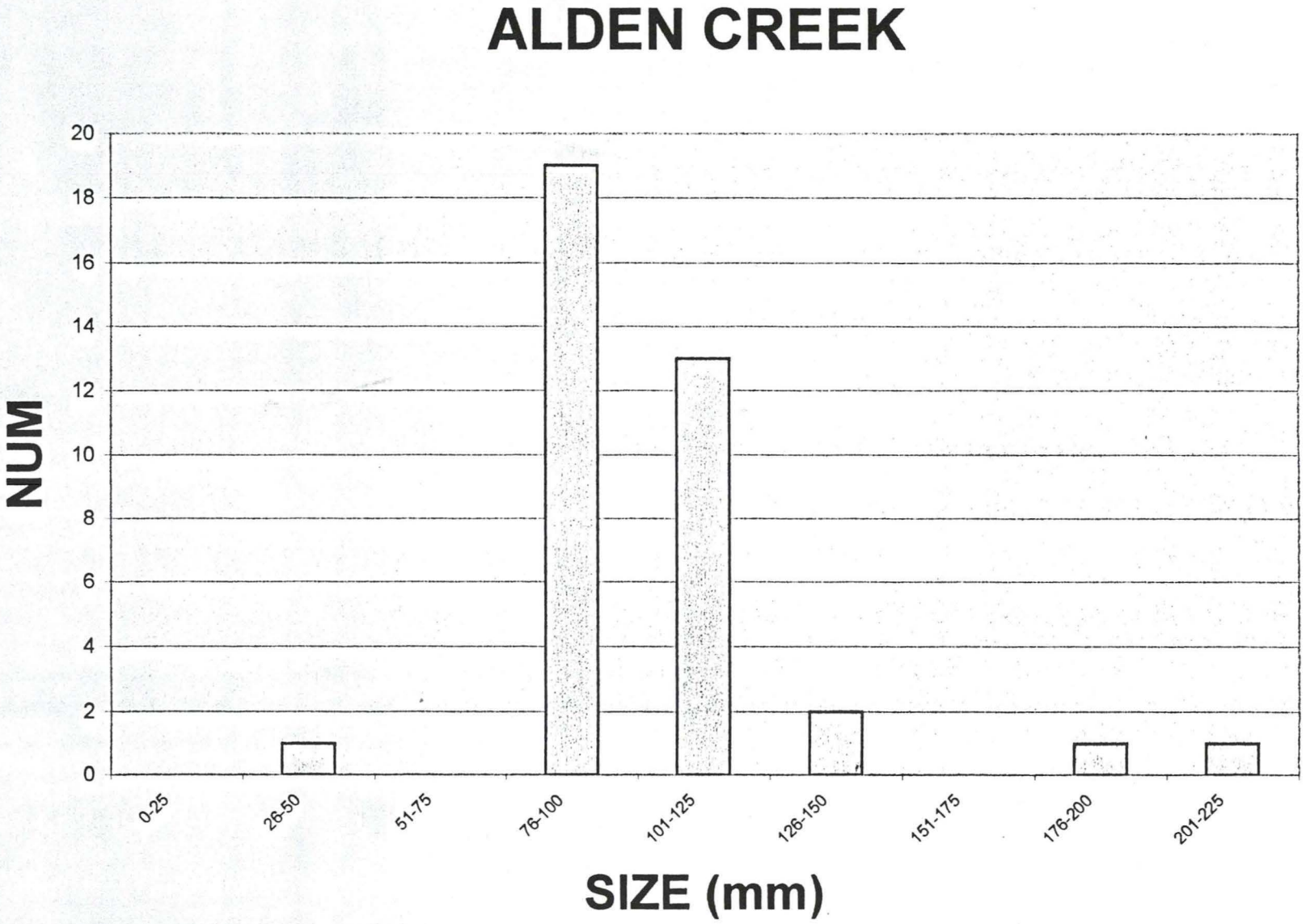
| STREAM | REACH | SITE | DATE | WETTED WIDTH | CT > 60 | CT <= 60 | CT <= 50 | CT <= 40 | CT TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| UPPER JORDAN CREEK | 1 | 1 | 09/04/96 | 3.222222 | 0 | 0 | 0 | 0 | 0 |
| | | 2 | 09/04/96 | 2.555556 | 1 | 1 | 1 | 0 | 2 |
| | | 3 | 09/04/96 | 3.111111 | 3 | 1 | 1 | 0 | 5 |
| | 2 | 1 | 09/04/96 | 3 | 2 | 6 | 3 | 0 | 8 |
| | | 2 | 09/04/96 | 2.222222 | 2 | 1 | 0 | 0 | 3 |
| | | 3 | 09/04/96 | 2.555556 | 2 | 1 | 1 | 1 | 3 |
| | 3 | 1 | 09/04/96 | 2.888889 | 1 | 0 | 0 | 0 | 1 |
| | | 2 | 09/04/96 | 2.444444 | 4 | 2 | 1 | 0 | 6 |
| | | 3 | 09/04/96 | ~ | 1 | 6 | 5 | 5 | 7 |
| W. FK. STEAMBOAT | 1 | 1 | 09/06/96 | 4 | 4 | 0 | 0 | 0 | 4 |
| | | 2 | 09/06/96 | 4.5 | 2 | 0 | 0 | 0 | 2 |
| | | 3 | 09/06/96 | 6 | 2 | 0 | 0 | 0 | 2 |
| | 2 | 1 | 09/06/96 | 3.25 | 2 | 0 | 0 | 0 | 2 |
| | | 2 | 09/06/96 | 3 | 10 | 0 | 0 | 0 | 10 |
| | | 3 | 09/06/96 | 3.25 | 3 | 2 | 2 | 2 | 5 |
| | 3 | 1 | 09/06/96 | 2 | 8 | 0 | 0 | 0 | 8 |
| | | 2 | 09/06/96 | 1.5 | 21 | 0 | 0 | 0 | 21 |
| | | 3 | 09/06/96 | 1.75 | 9 | 2 | 2 | 2 | 11 |
| WHITETAIL CREEK | 1 | 1 | 09/08/96 | 2.444444 | 1 | 0 | 0 | 0 | 1 |
| | | 2 | 09/08/96 | 1.888889 | 0 | 0 | 0 | 0 | 0 |
| | | 3 | 09/08/96 | 2 | 4 | 1 | 1 | 0 | 5 |
| | 2 | 1 | 09/08/96 | 2.666667 | 1 | 0 | 0 | 0 | 1 |
| | | 2 | 09/08/96 | 2.666667 | 4 | 3 | 0 | 0 | 7 |
| | | 3 | 09/08/96 | 1.777778 | 2 | 4 | 4 | 2 | 6 |
| | 3 | 1 | 09/08/96 | 3.111111 | 7 | 0 | 0 | 0 | 7 |
| | | 2 | 09/08/96 | 2.333333 | 10 | 3 | 3 | 2 | 13 |
| | | 3 | 09/08/96 | 3 | 12 | 1 | 1 | 1 | 13 |

Table 1. Continued

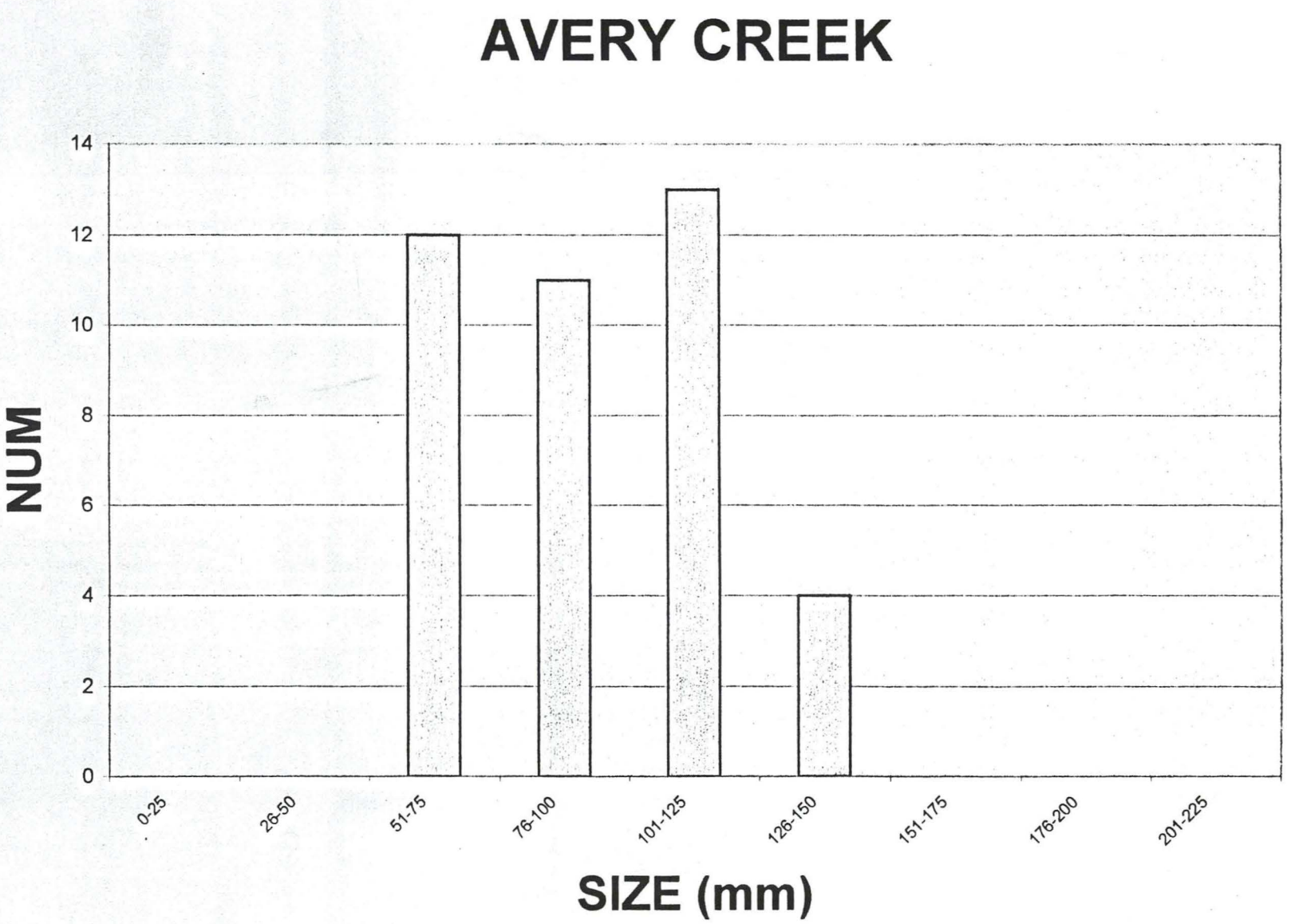
| STREAM | REACH | SITE | DATE | WETTED WIDTH | CT > 60 | CT <= 60 | CT <= 50 | CT <= 40 | CT TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| YELLOWDOG CREEK | 1 | 1 | 08/06/96 | 6.116667 | 2 | 1 | 1 | 1 | 3 |
| | | 2 | 08/06/96 | 7.273333 | 0 | 1 | 1 | 1 | 1 |
| | | 3 | 08/06/96 | 5.633333 | 0 | 0 | 0 | 0 | 0 |
| | 2 | 1 | 08/06/96 | 4.953333 | 0 | 0 | 0 | 0 | 0 |
| | | 2 | 08/06/96 | 4.826667 | 4 | 0 | 0 | 0 | 4 |
| | | 3 | 08/06/96 | 5.98 | 5 | 0 | 0 | 0 | 5 |
| | 3 | 1 | 08/06/96 | 5.746667 | 3 | 0 | 0 | 0 | 3 |
| | | 2 | 08/06/96 | 5.873333 | 4 | 0 | 0 | 0 | 4 |
| | | 3 | 08/06/96 | 5.186667 | 1 | 0 | 0 | 0 | 1 |

Table 2. Concentrations of elemental calcium (Ca) and strontium (Sr) meassured from water samples collected in six streams in the Coeur d' Alene basin. Values presented represent the mean of three samples.

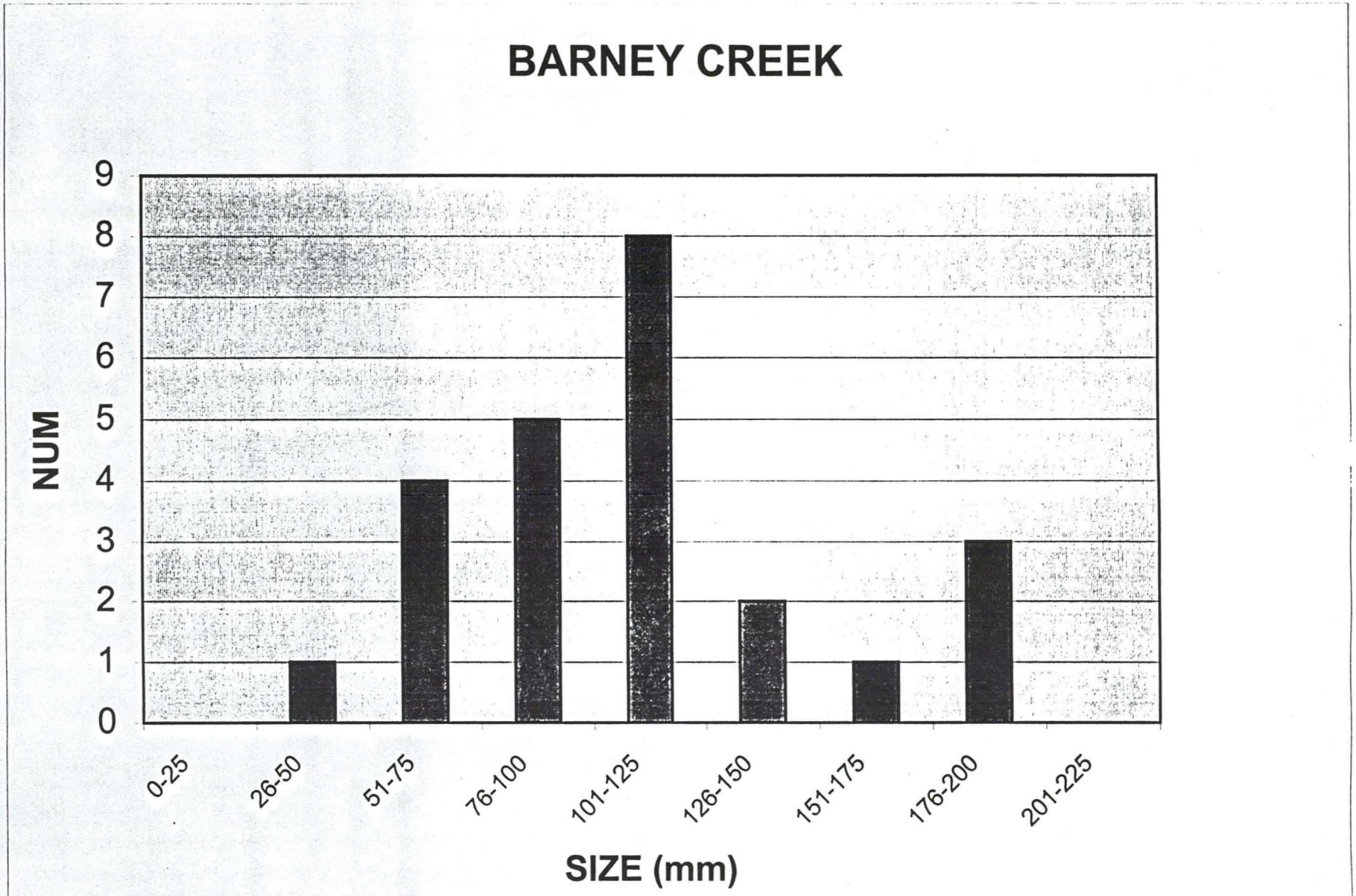
| Stream | Ca | Sr |
|---|---|---|
| Alden Creek | 9.187 | 0.0206 |
| Brett Creek | 12.633 | 0.0234 |
| Couer d' Alene River | 15.127 | 0.0457 |
| Deer Creek | 6.009 | 0.0184 |
| Jordan Creek | 6.173 | 0.0150 |
| Miner's creek | 14.507 | 0.0248 |



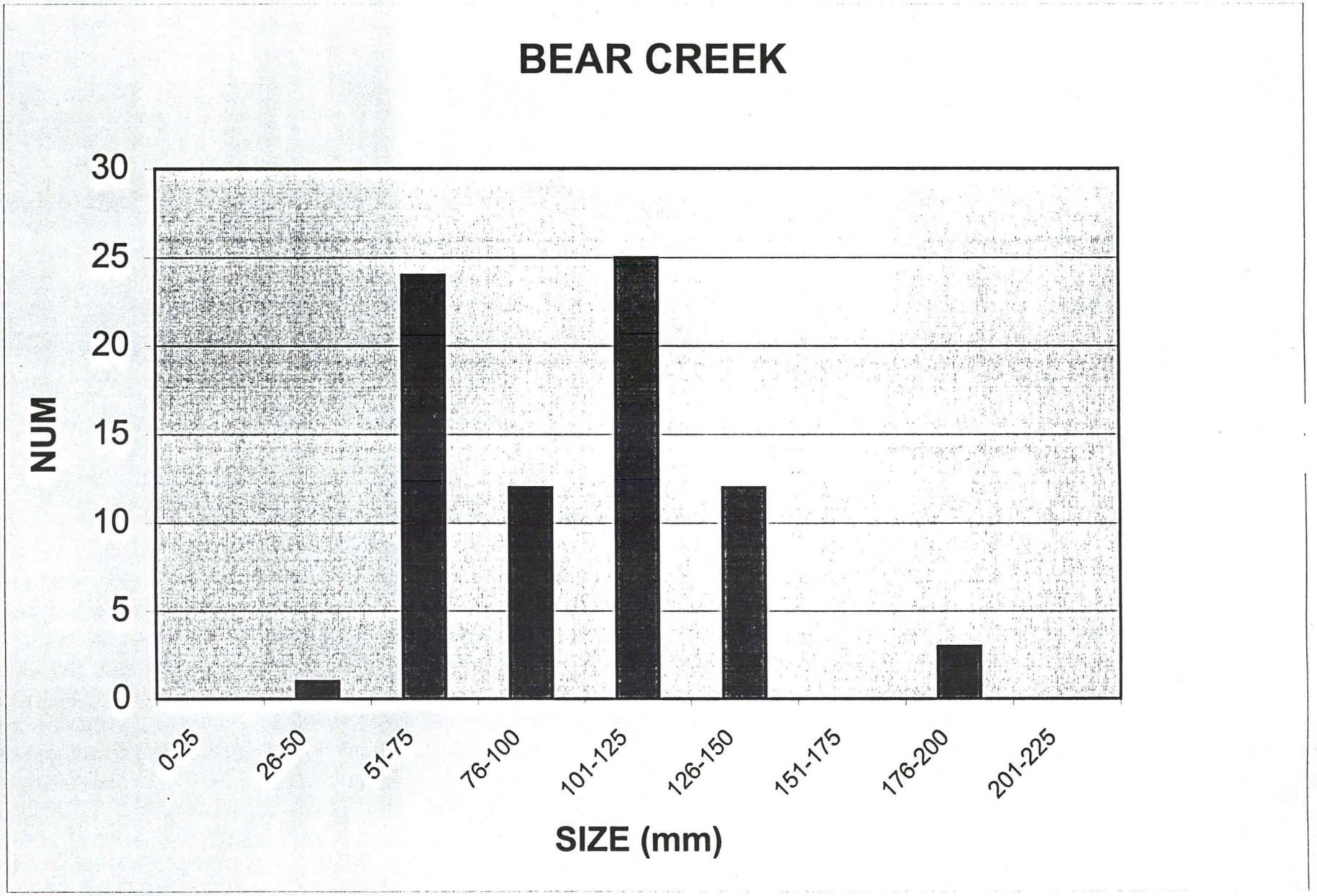

Appendix Figure 1. Length frequency distribution (numbers collected=num vs. fork length mm) of westslope cutthroat trout collected during 1996 from tributaries of the Coeur d' Alene River system.



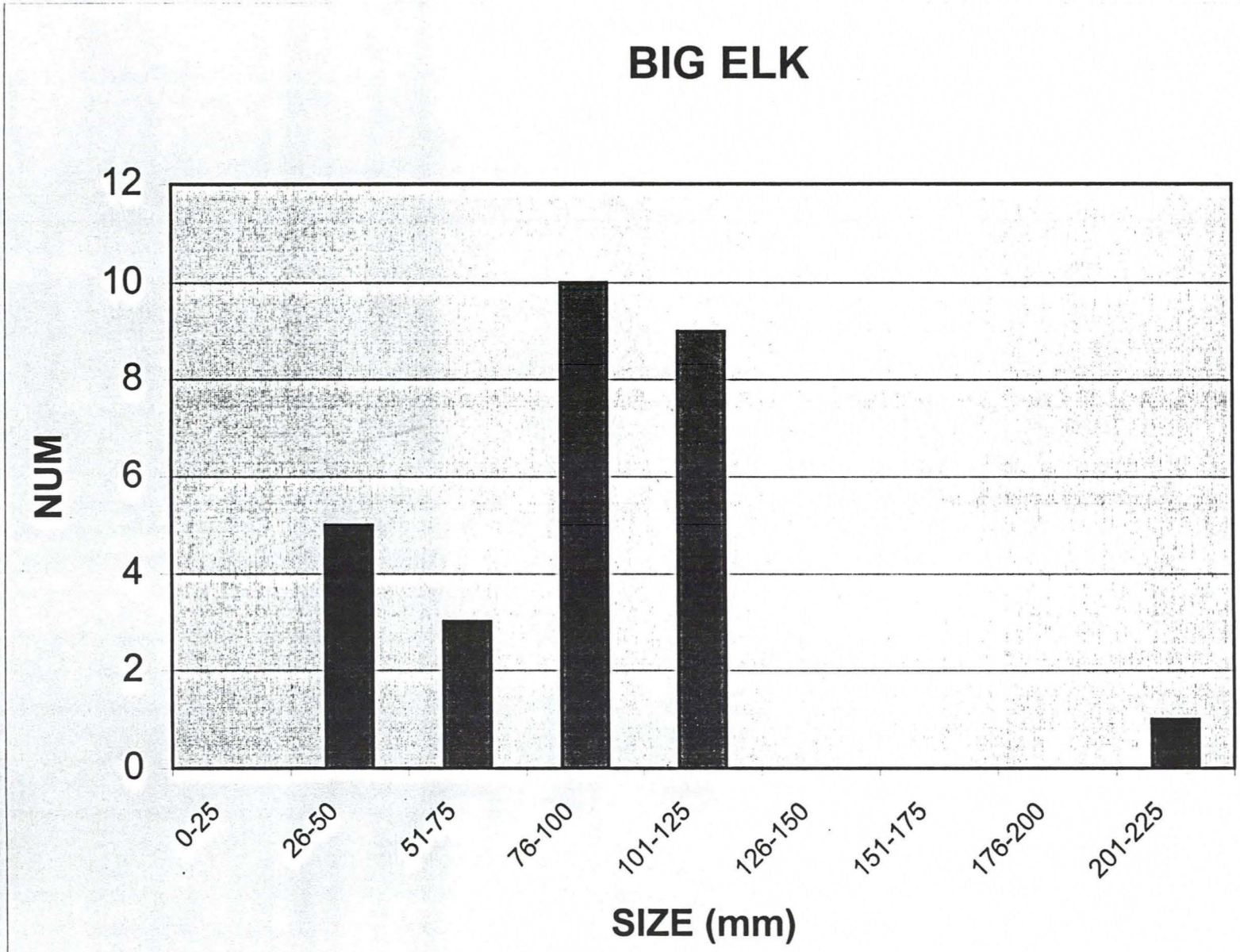

Appendix Figure 1. Continued



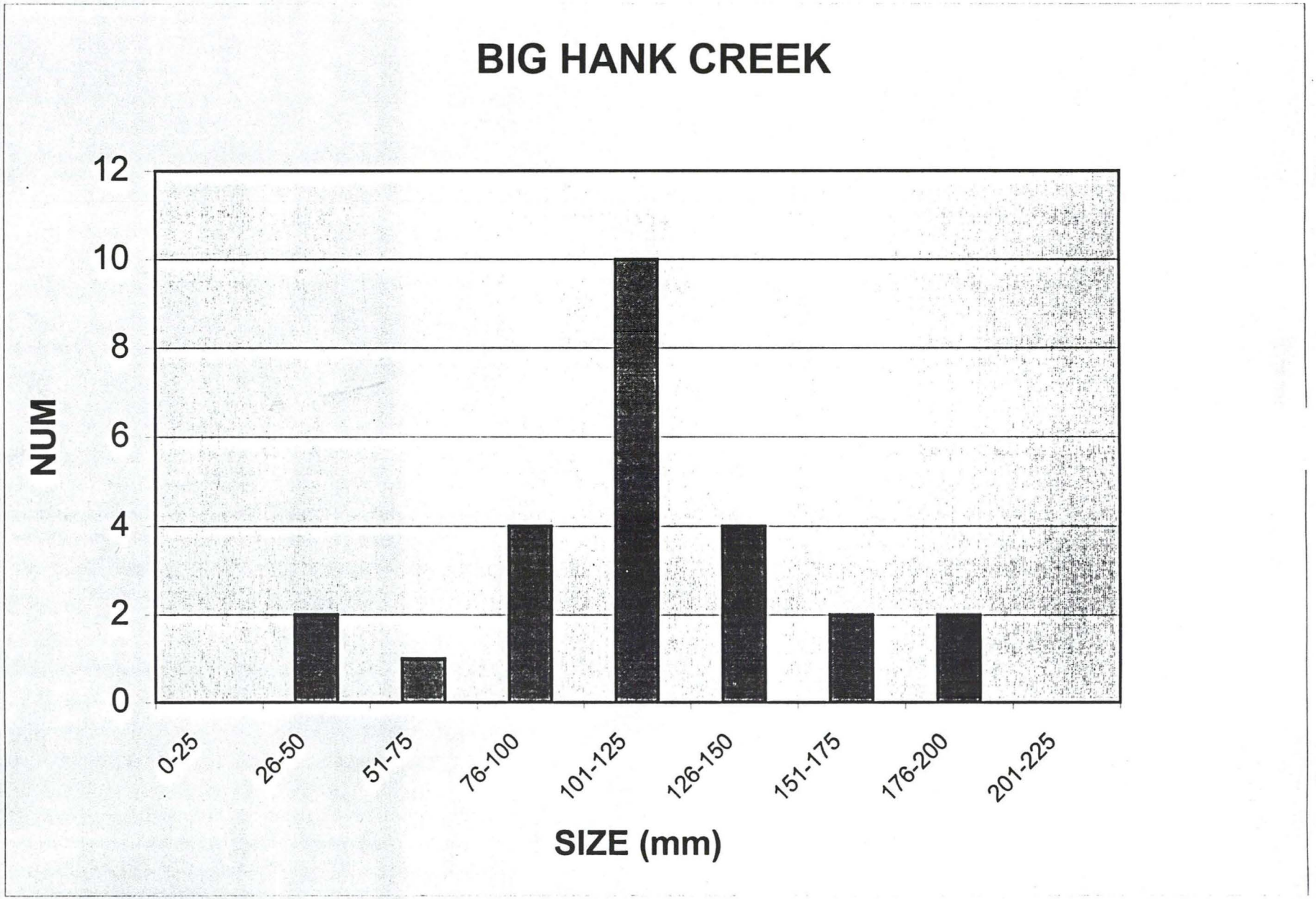

Appendix Figure 1. Continued



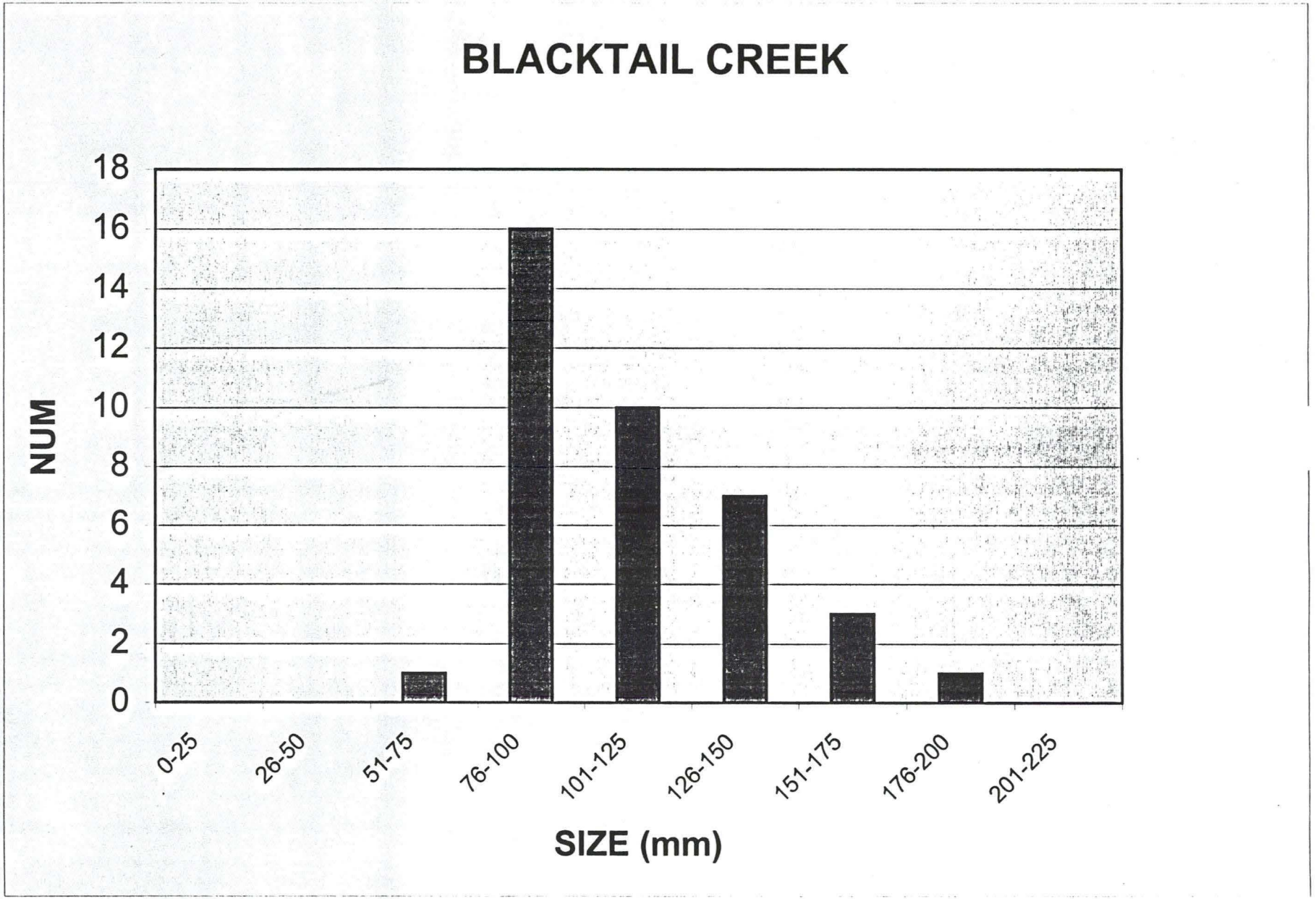

Appendix Figure 1. Continued



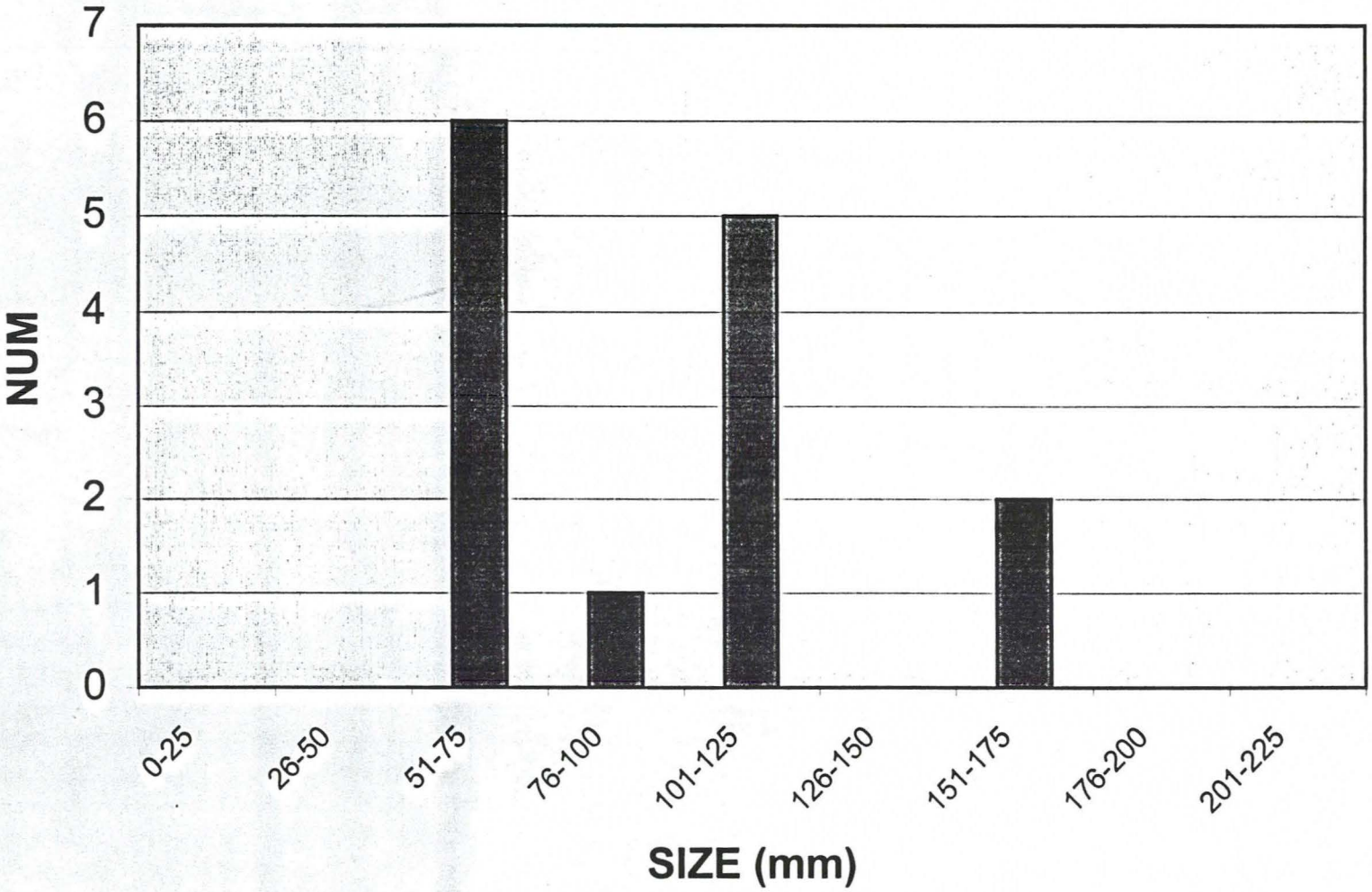

Appendix Figure 1. Continued



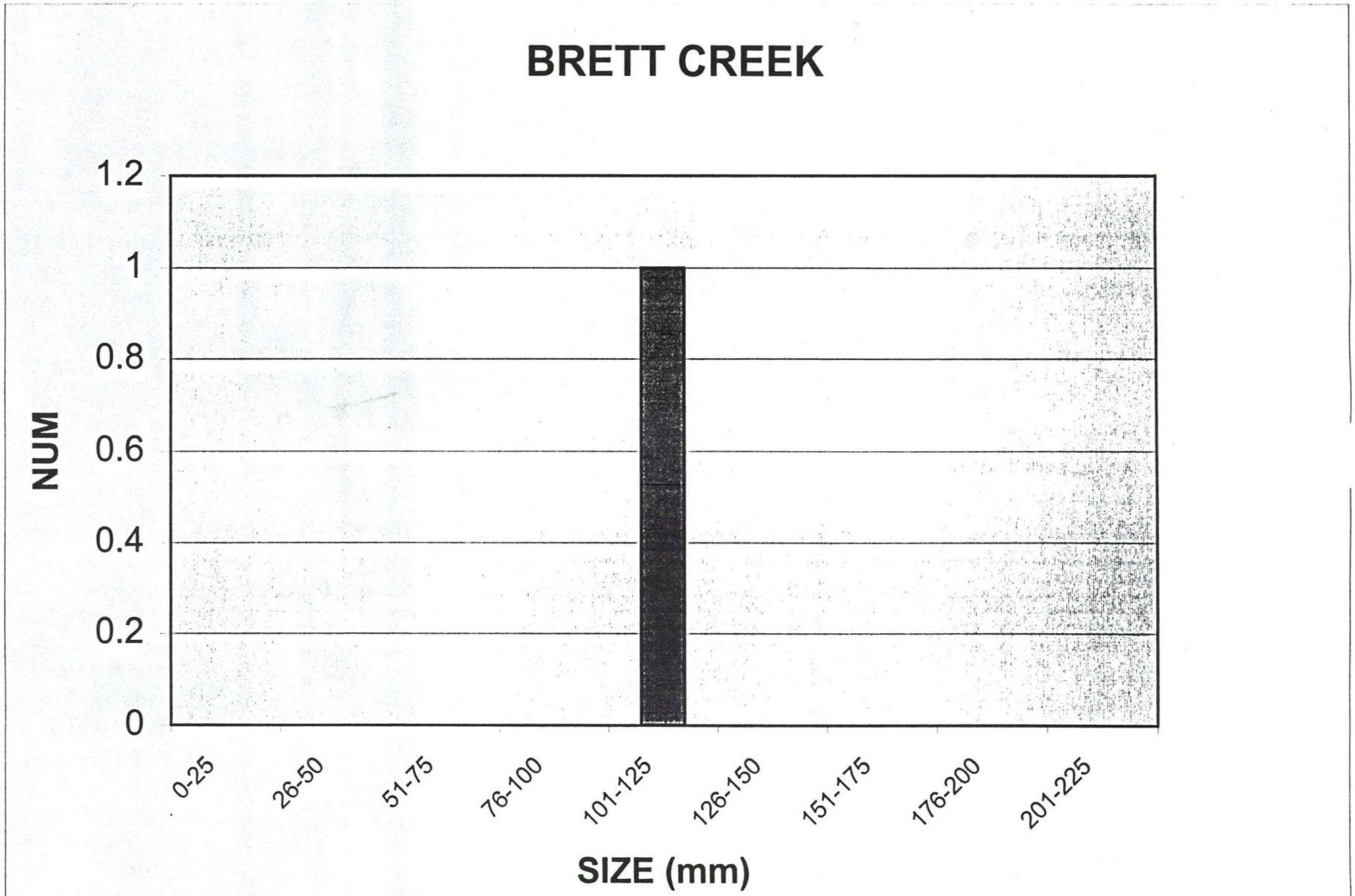

Appendix Figure 1. Continued



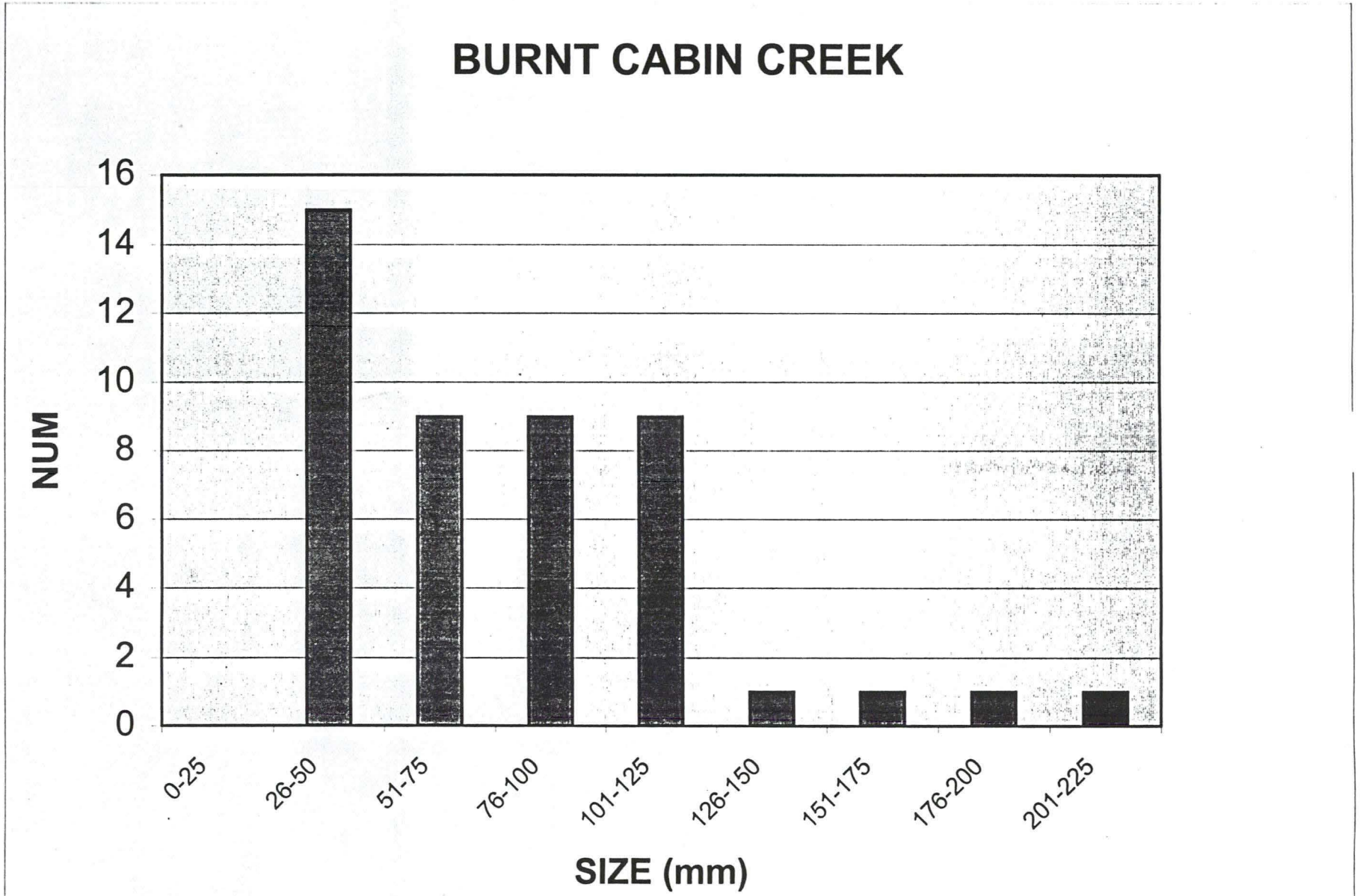

Appendix Figure 1. Continued



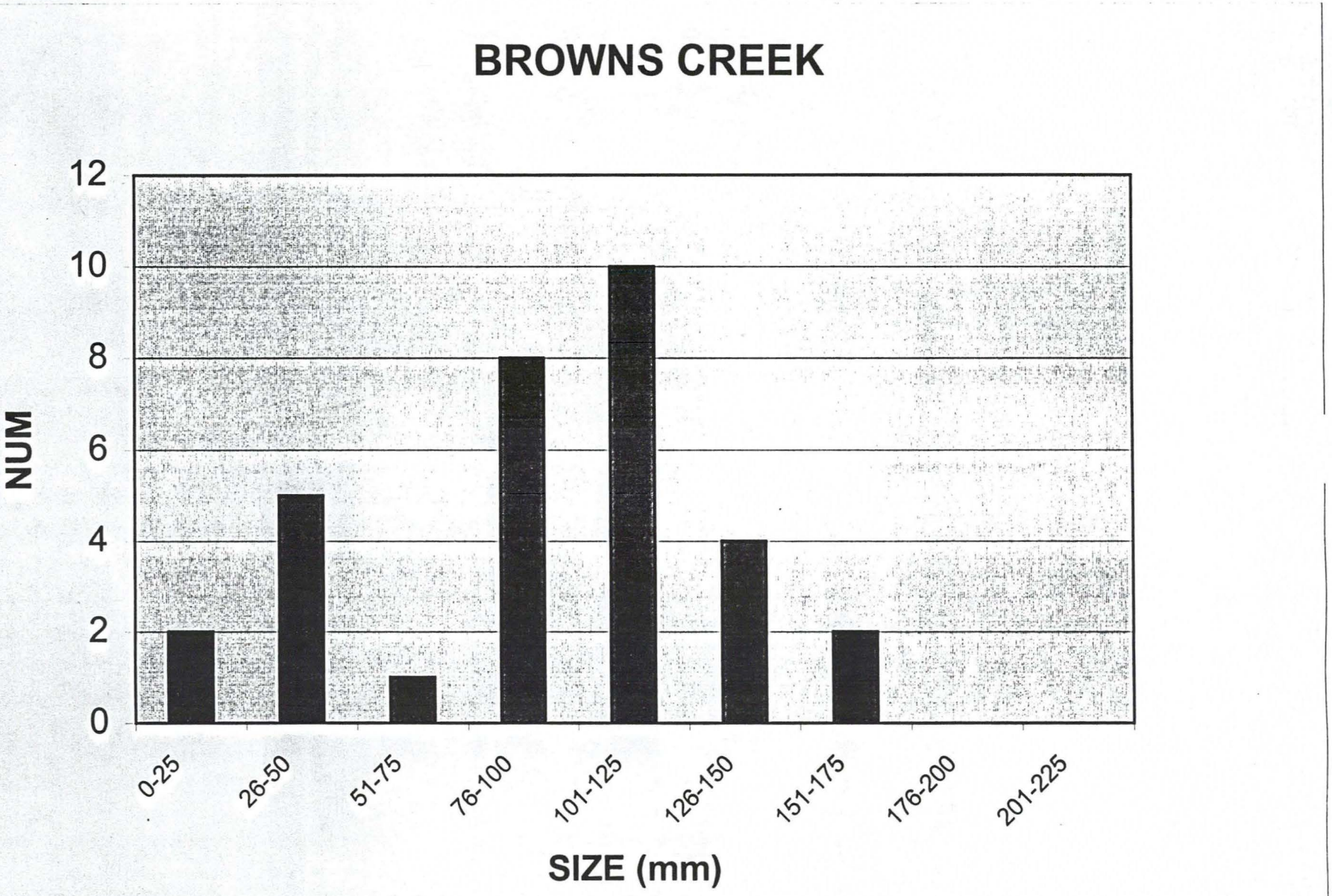

Appendix Figure 1. Continued



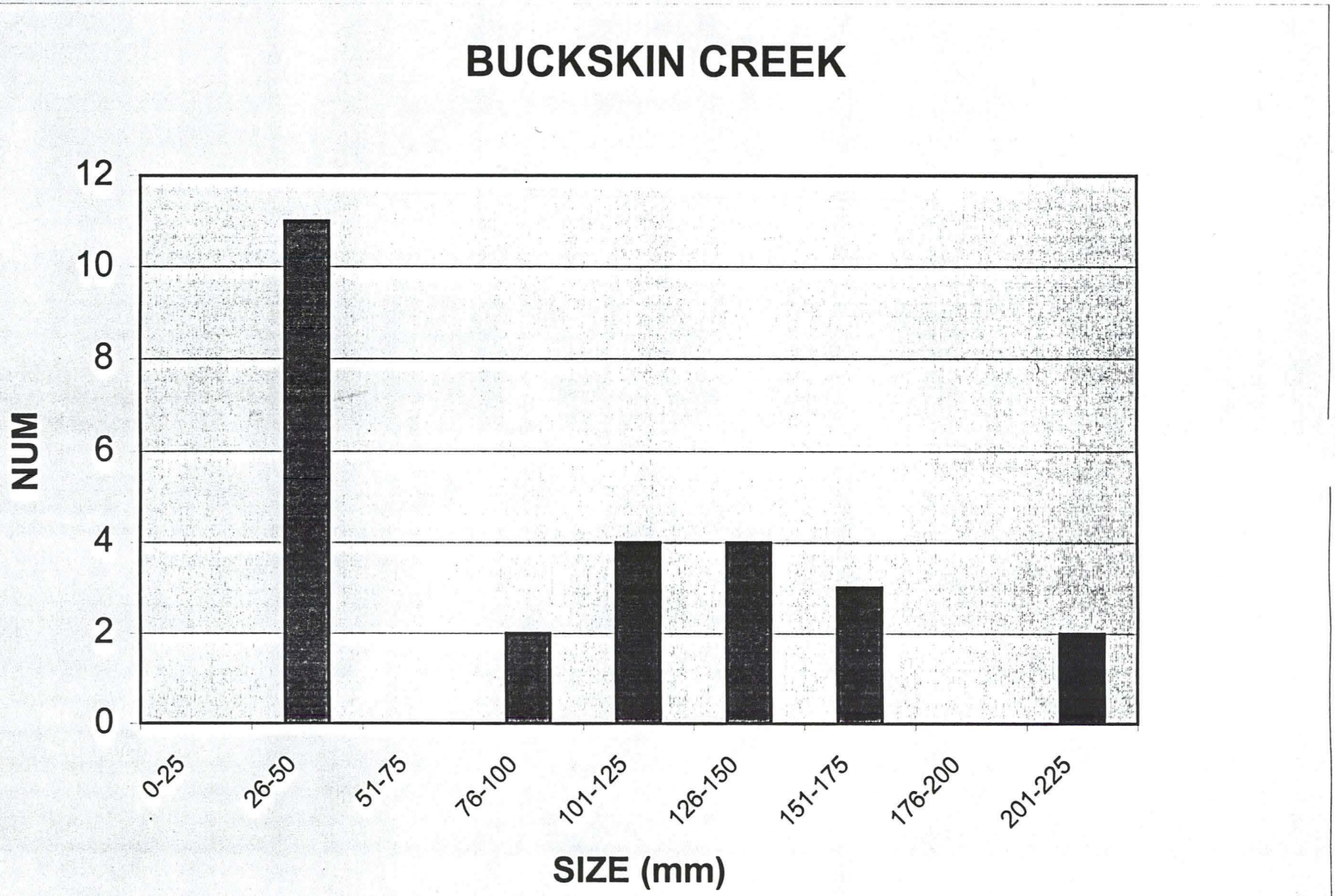

Appendix Figure 1. Continued



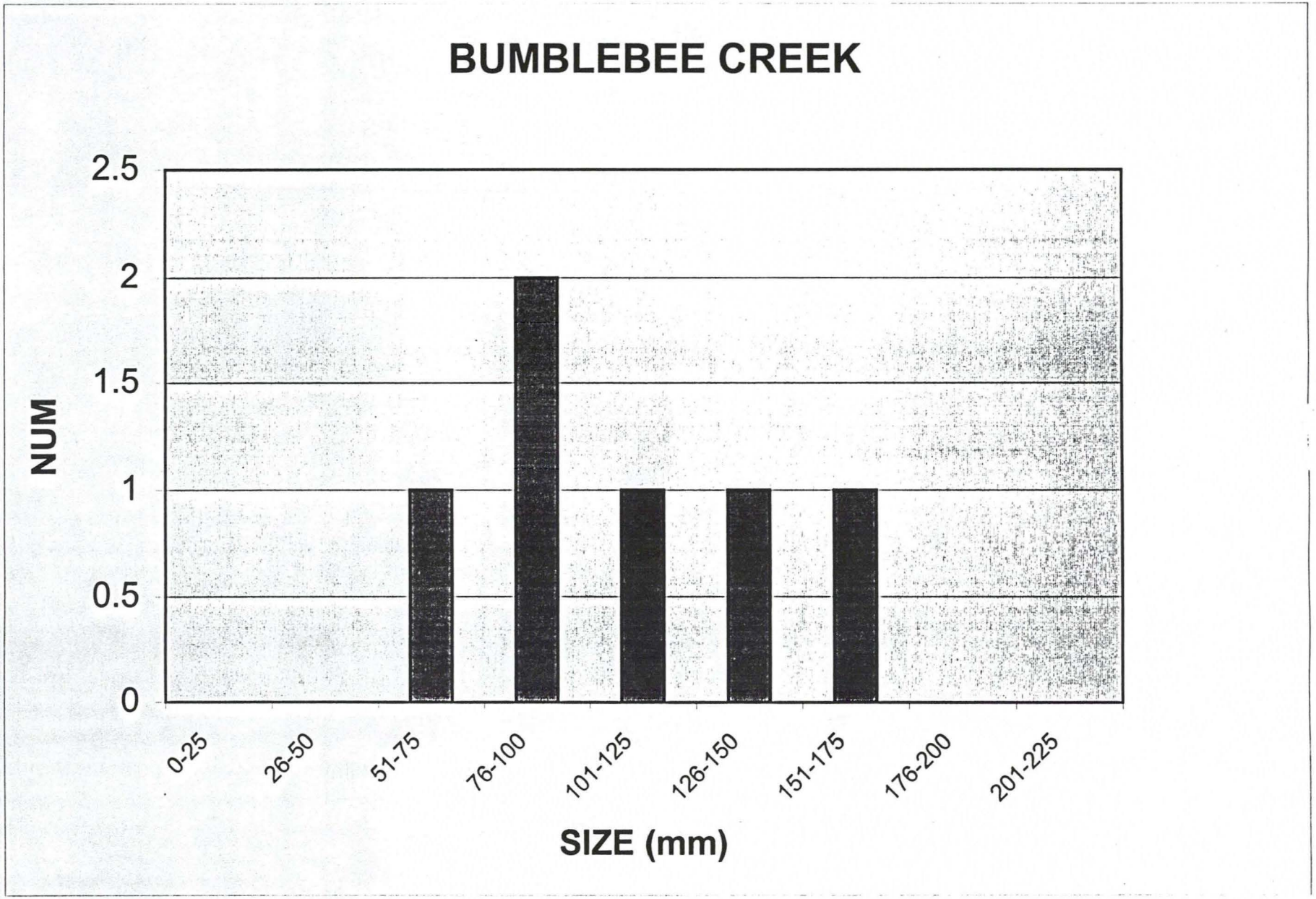

Appendix Figure 1. Continued



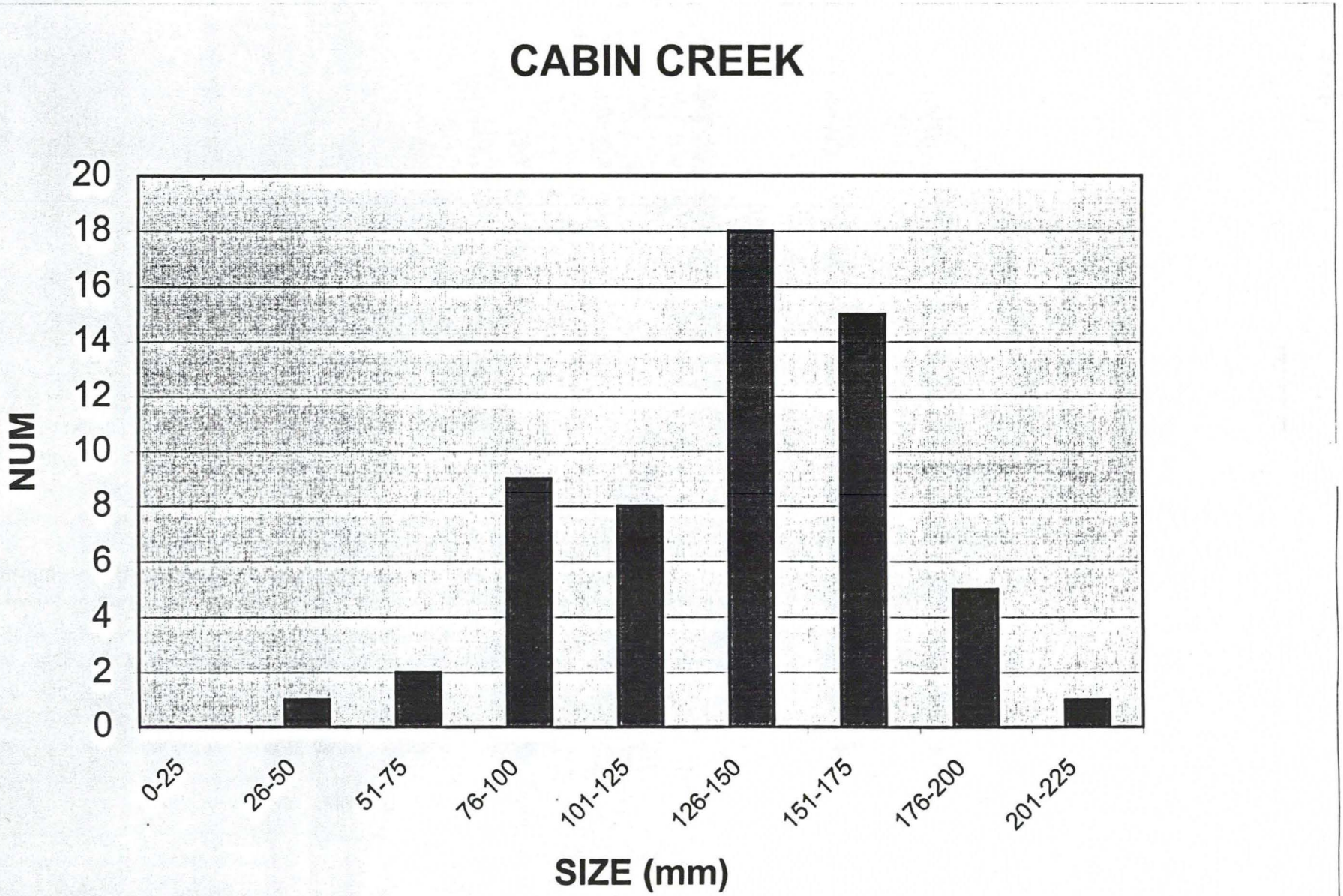

Appendix Figure 1. Continued



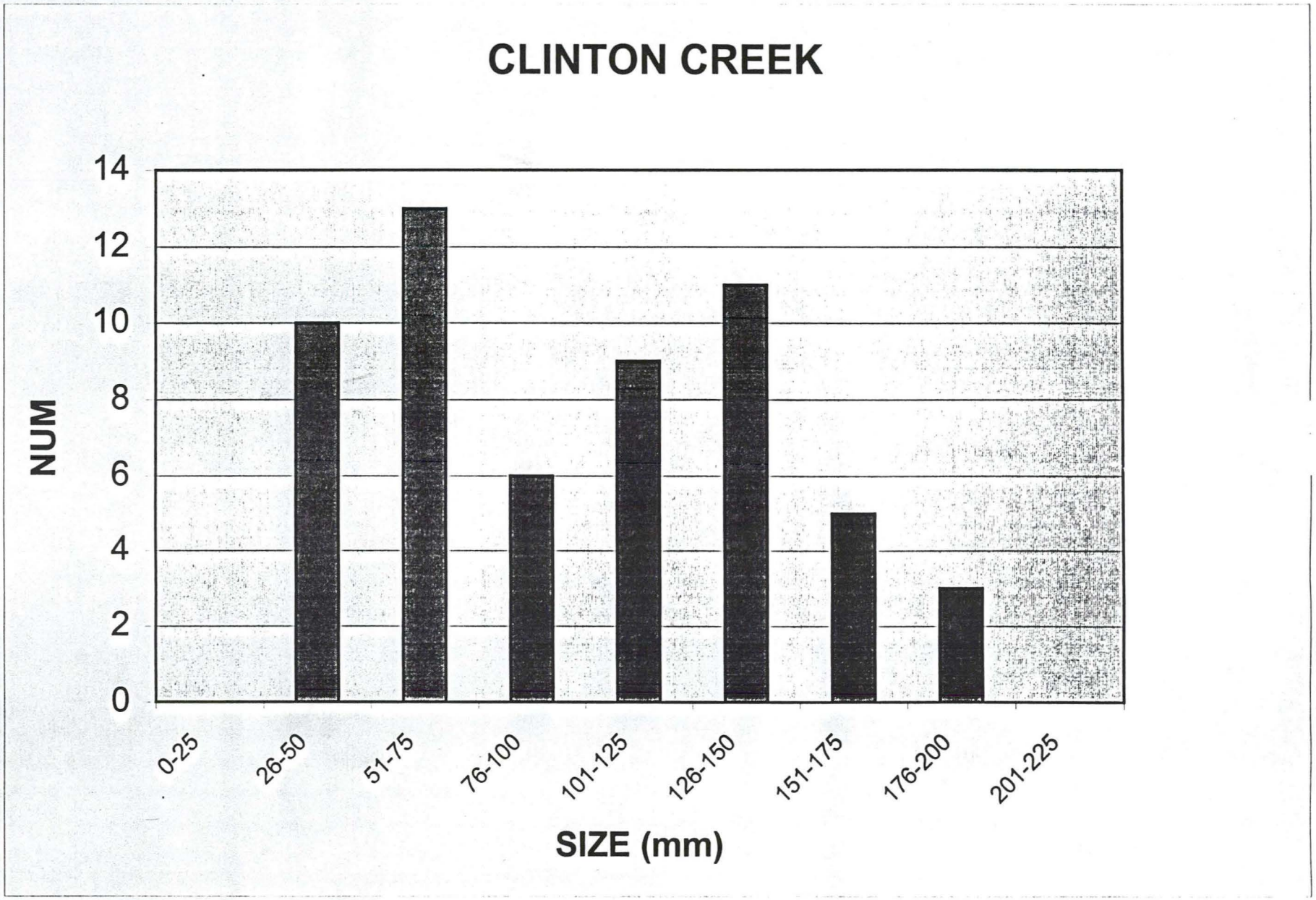

Appendix Figure 1. Continued



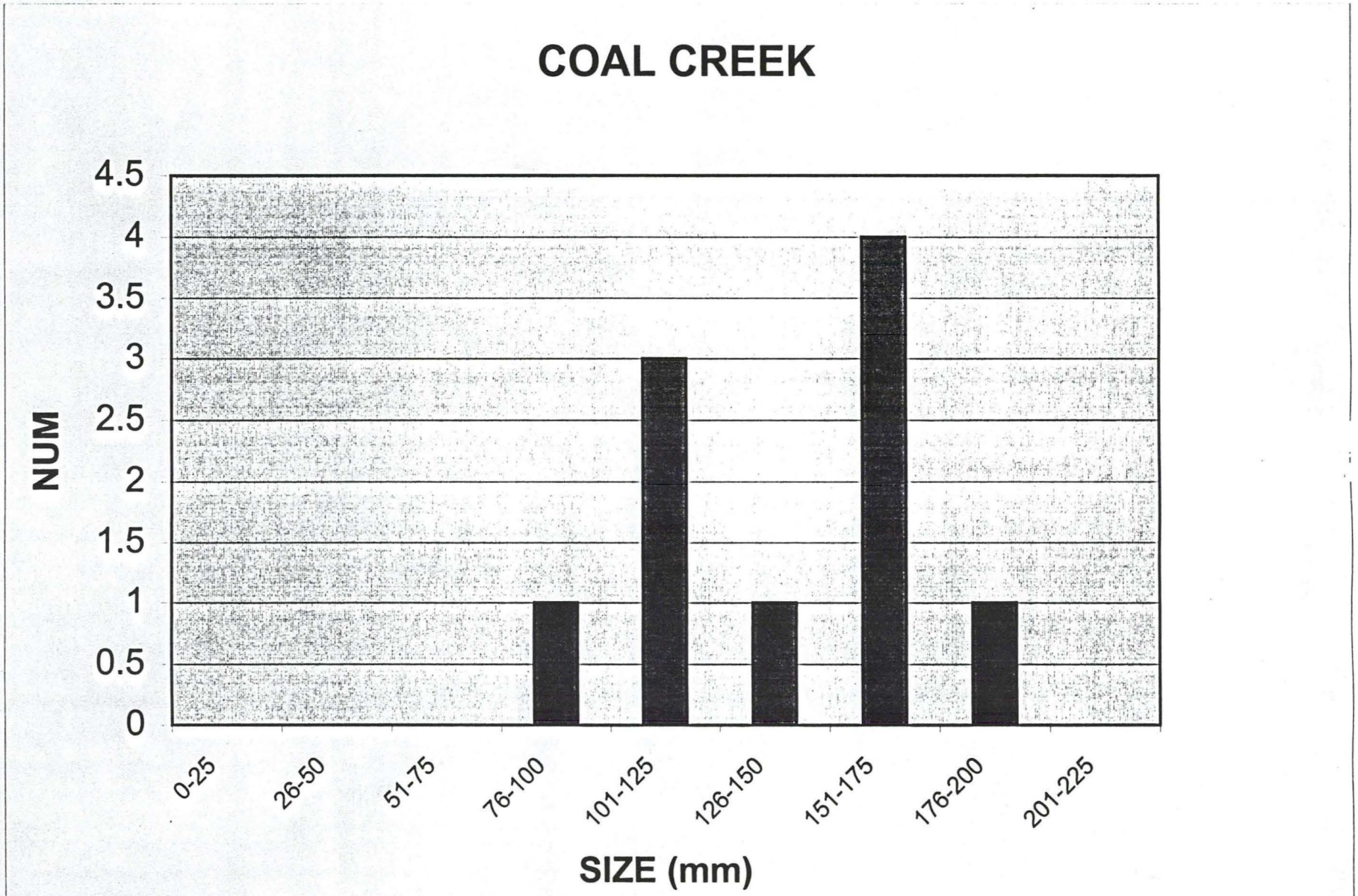

Appendix Figure 1. Continued



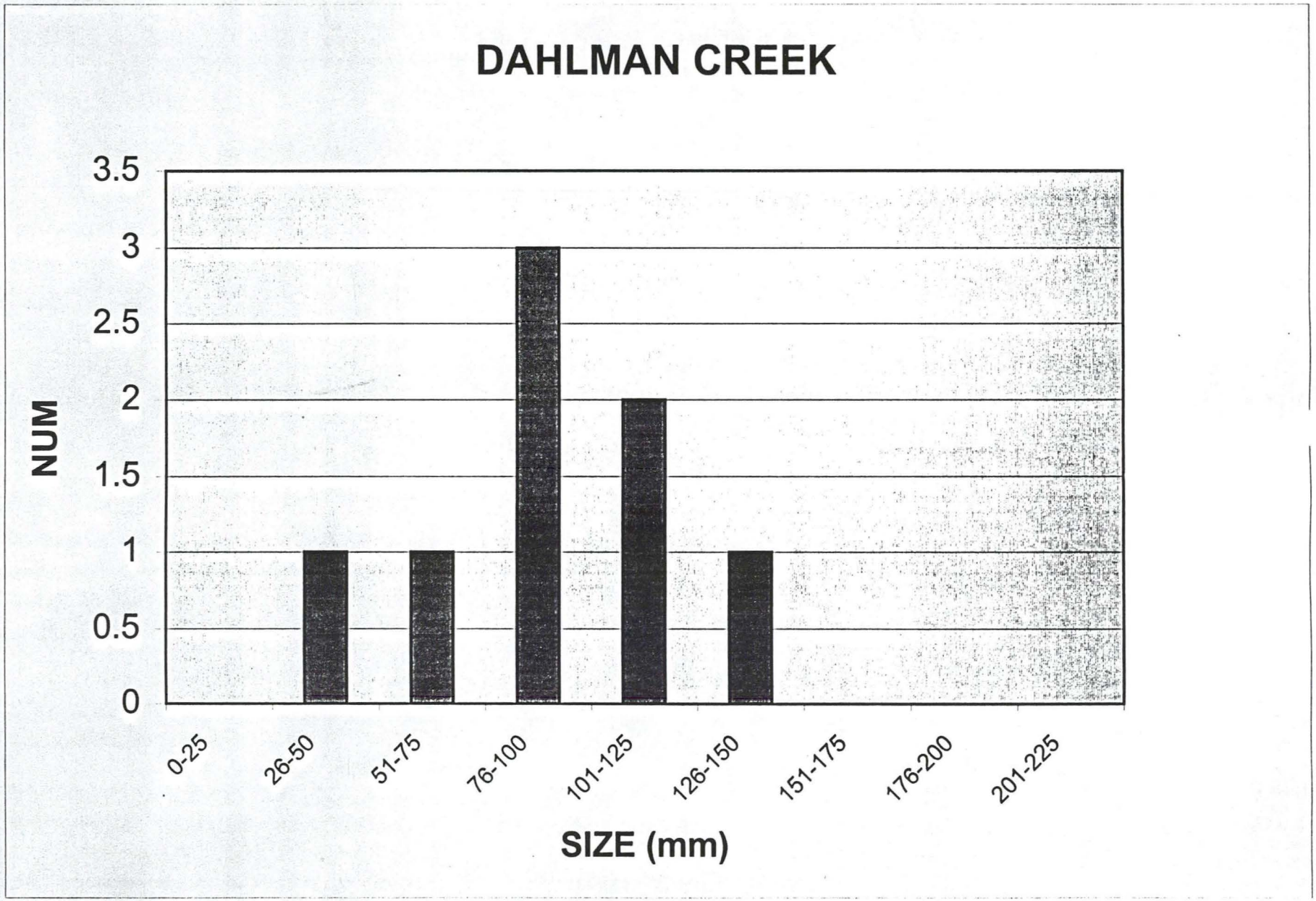

Appendix Figure 1. Continued



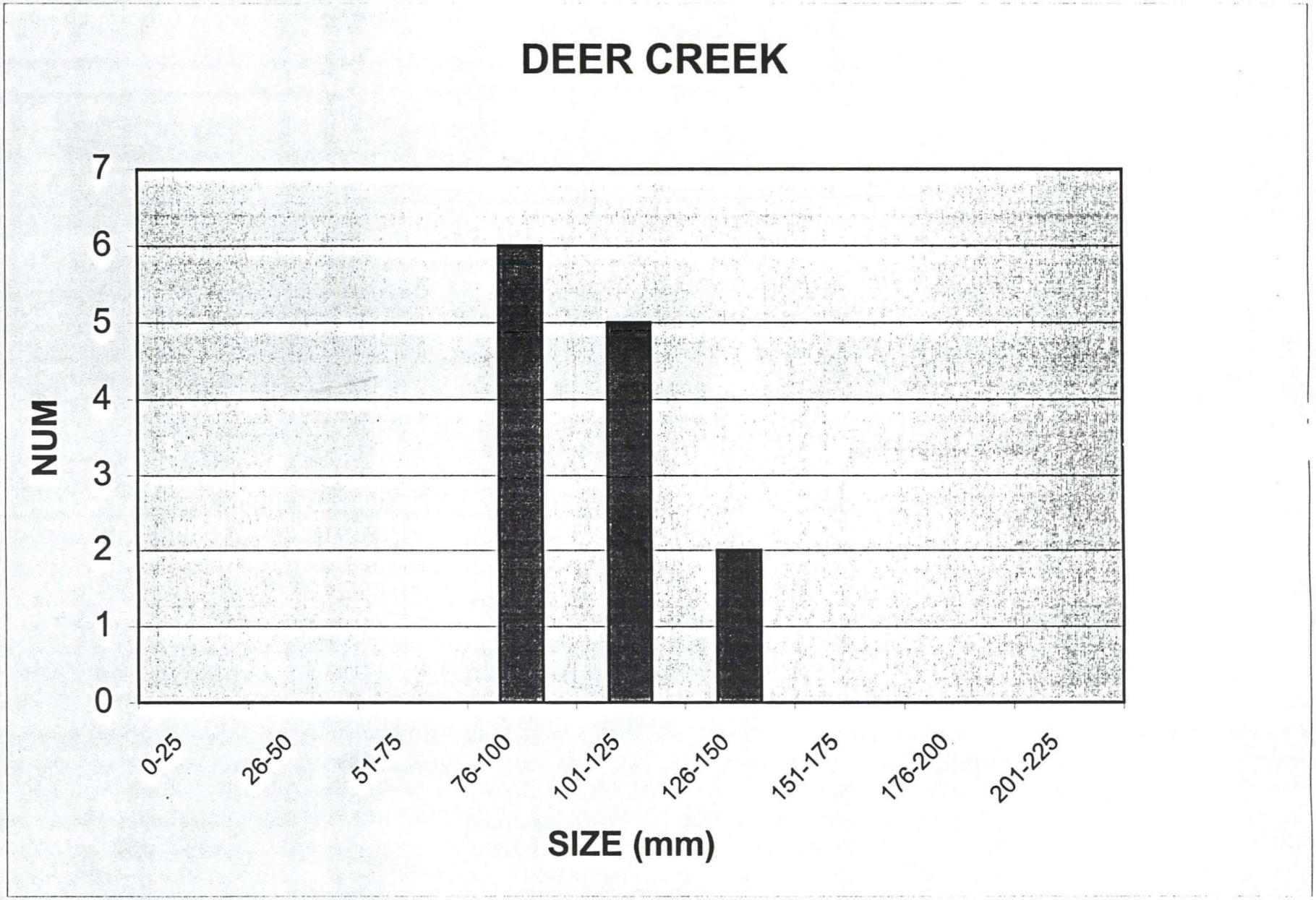

Appendix Figure 1. Continued



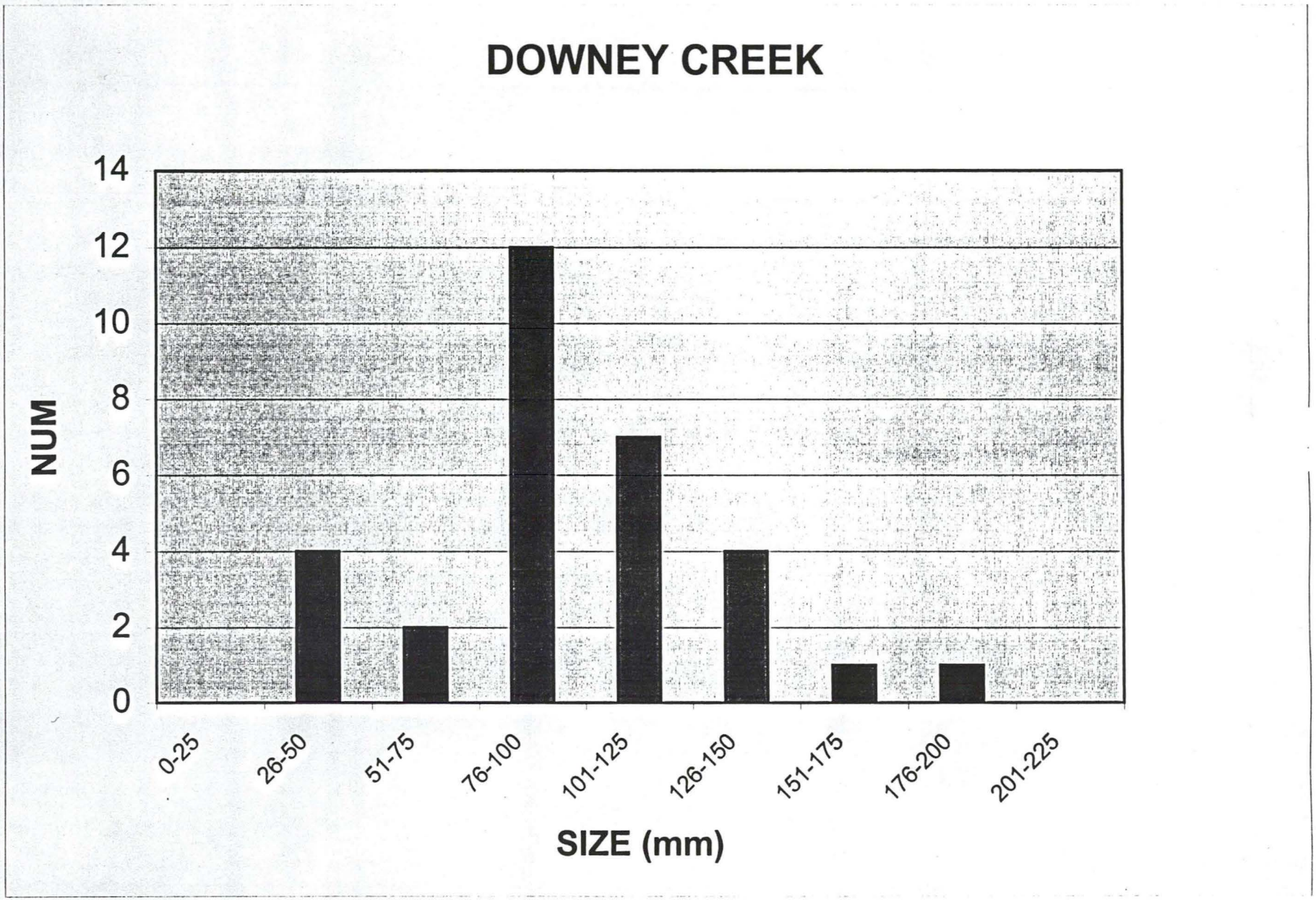

Appendix Figure 1. Continued



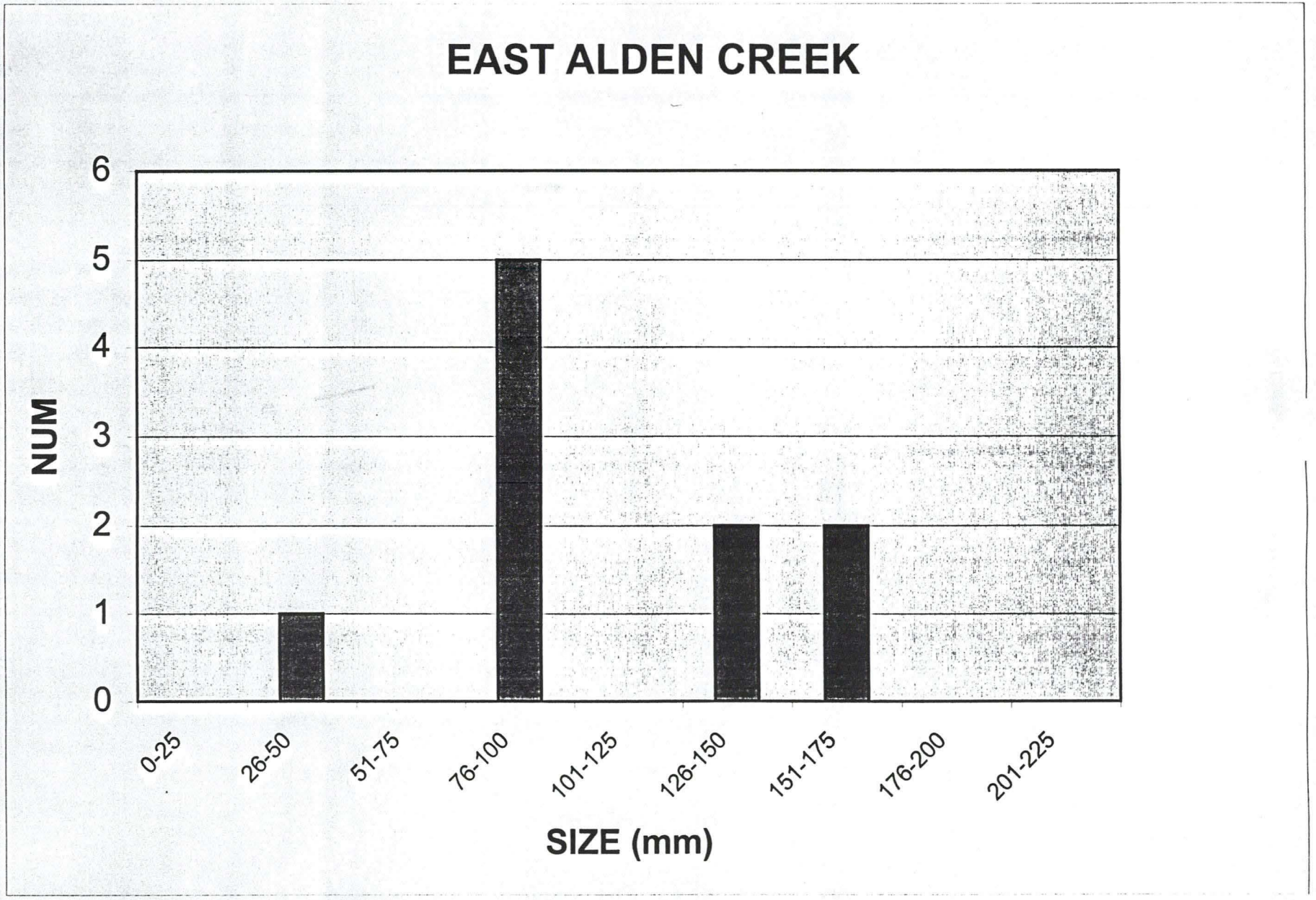

Appendix Figure 1. Continued



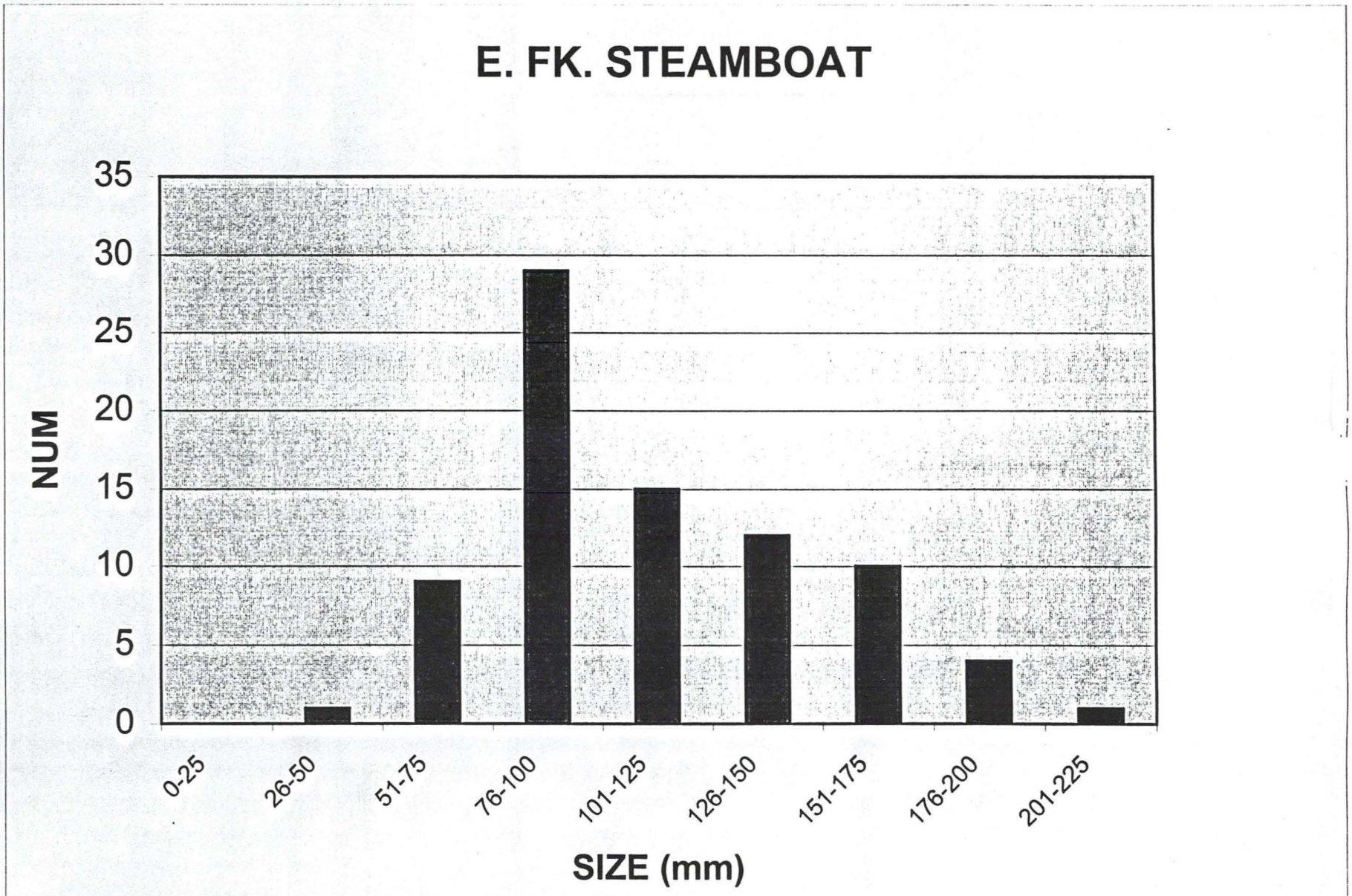

Appendix Figure 1. Continued



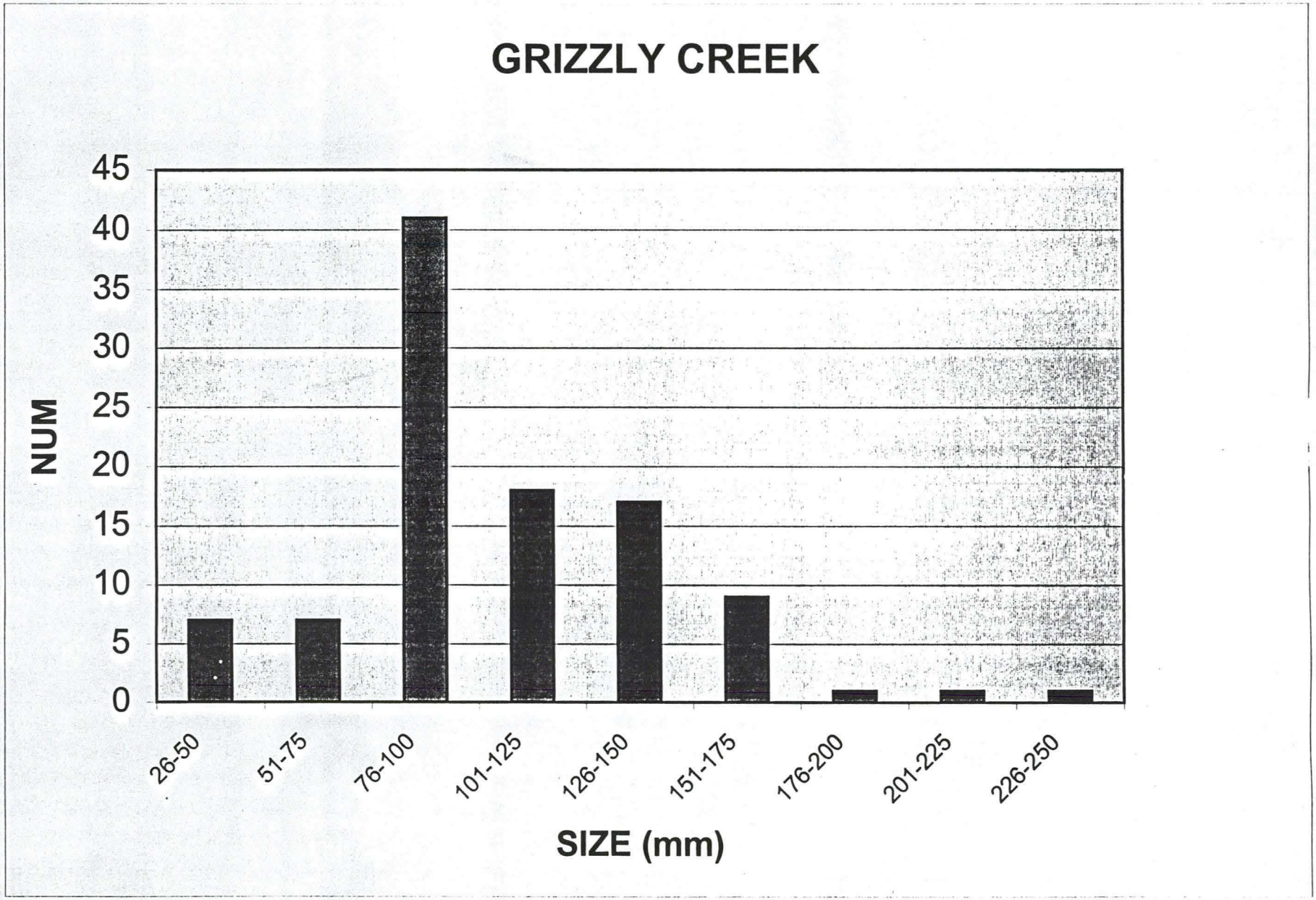

Appendix Figure 1. Continued



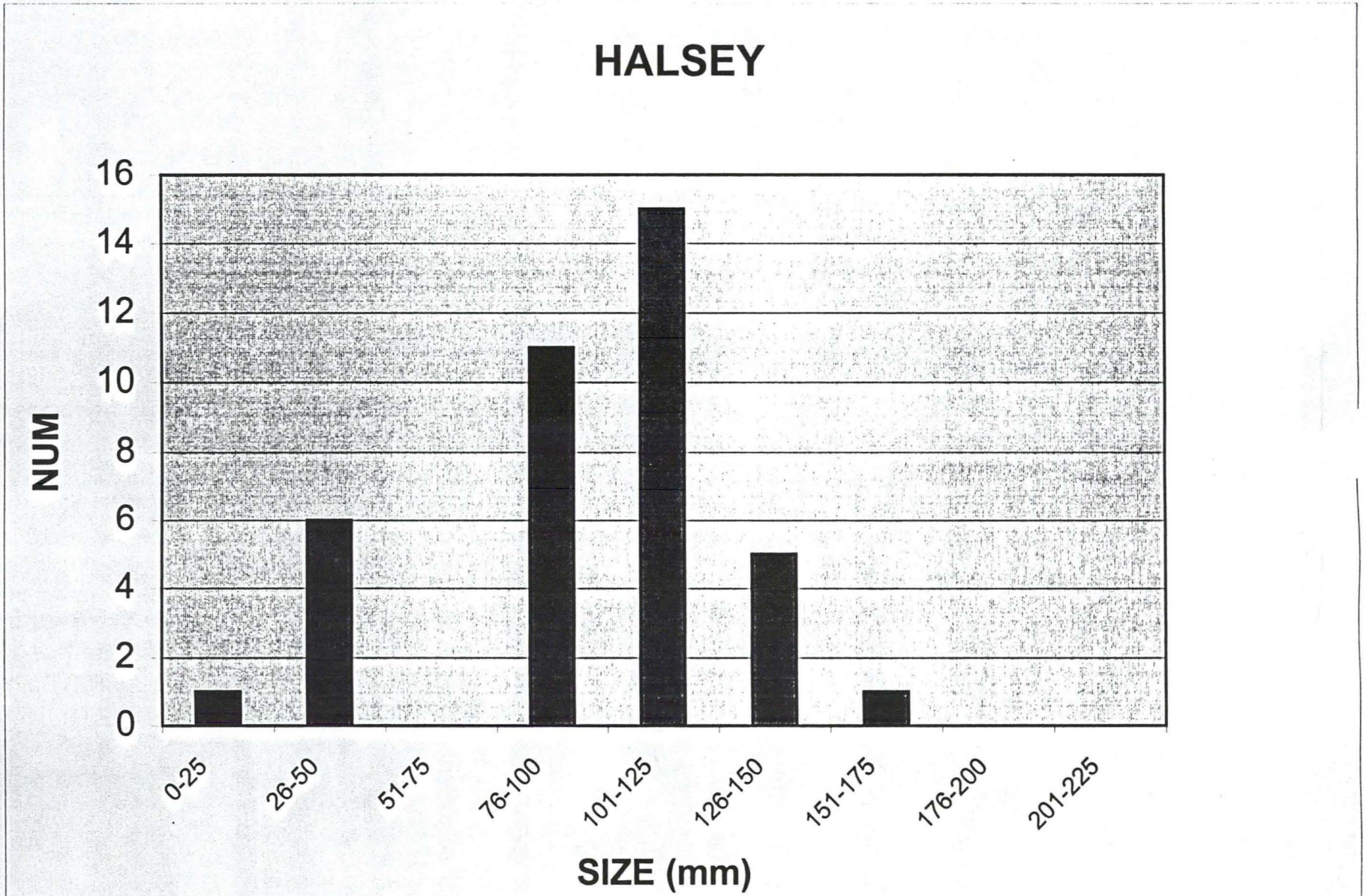

Appendix Figure 1. Continued



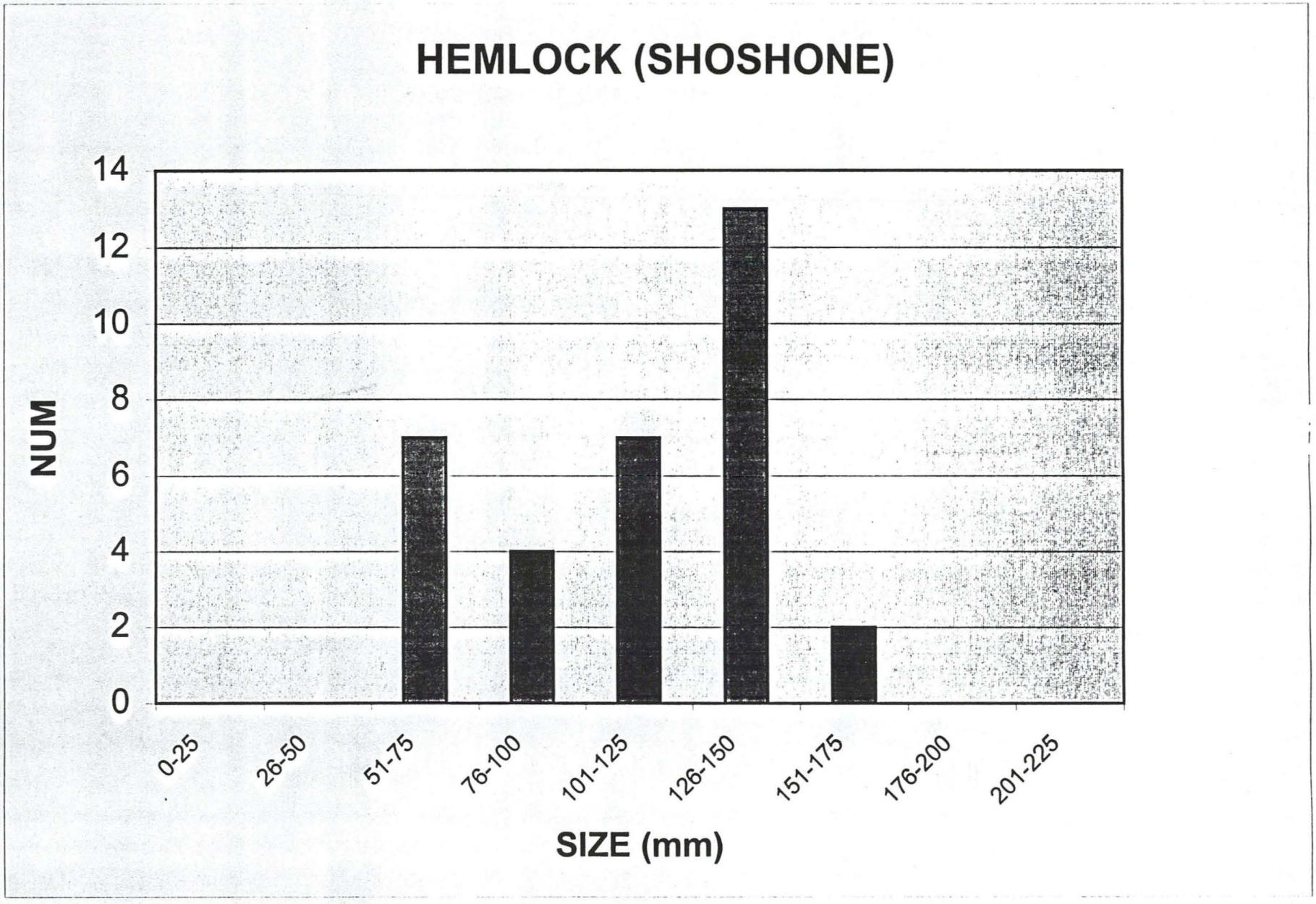

Appendix Figure 1. Continued



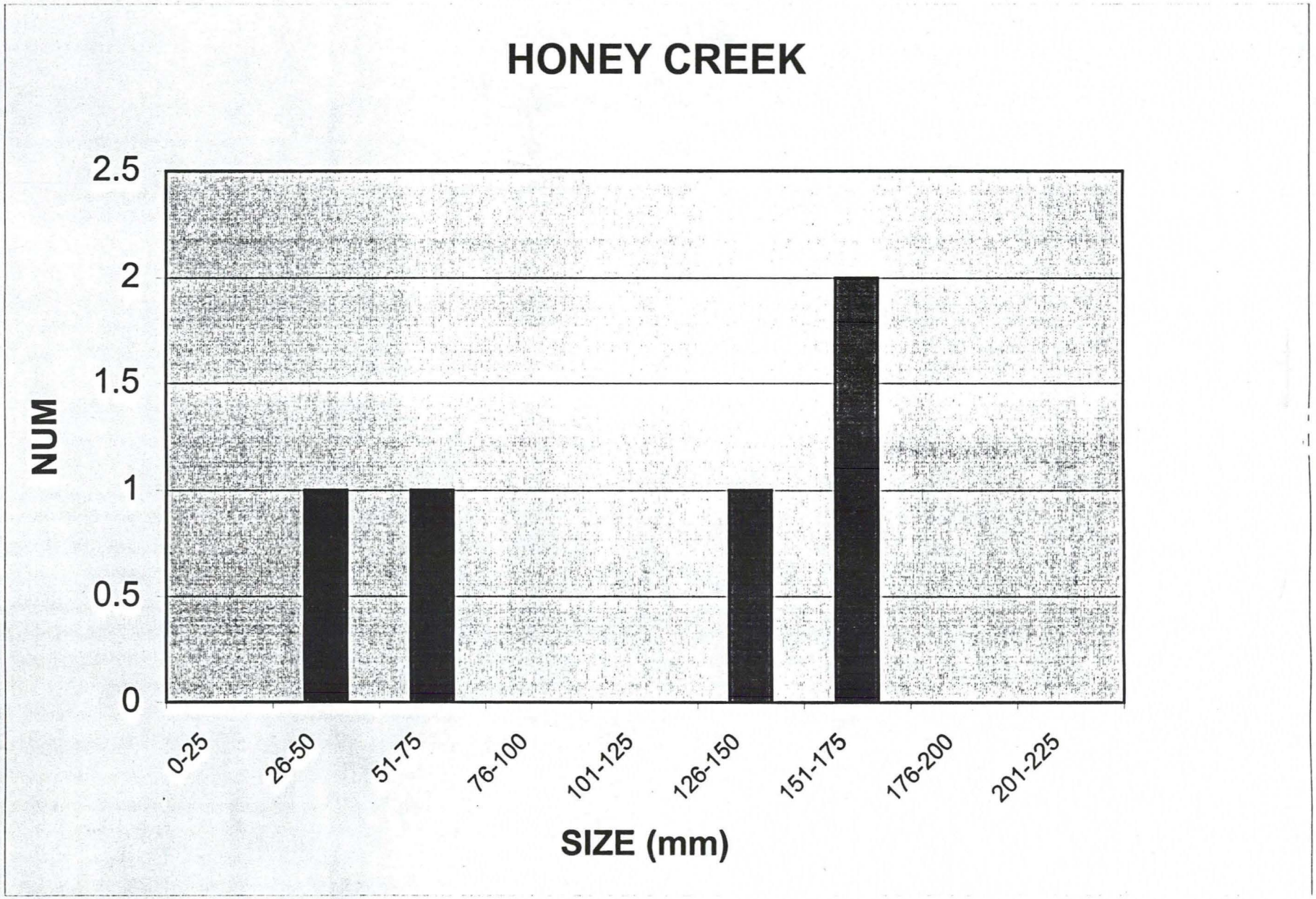

Appendix Figure 1. Continued



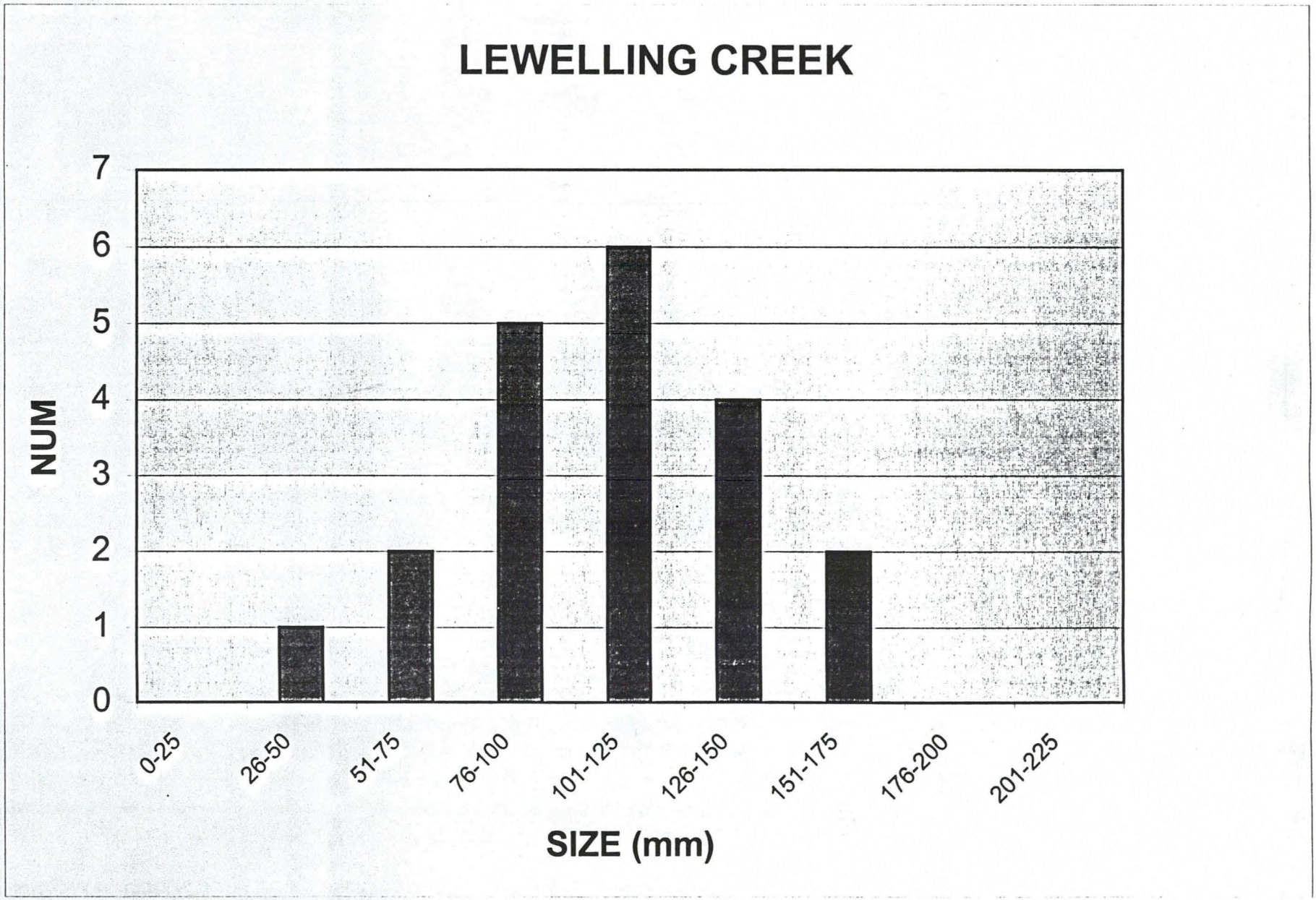

Appendix Figure 1. Continued



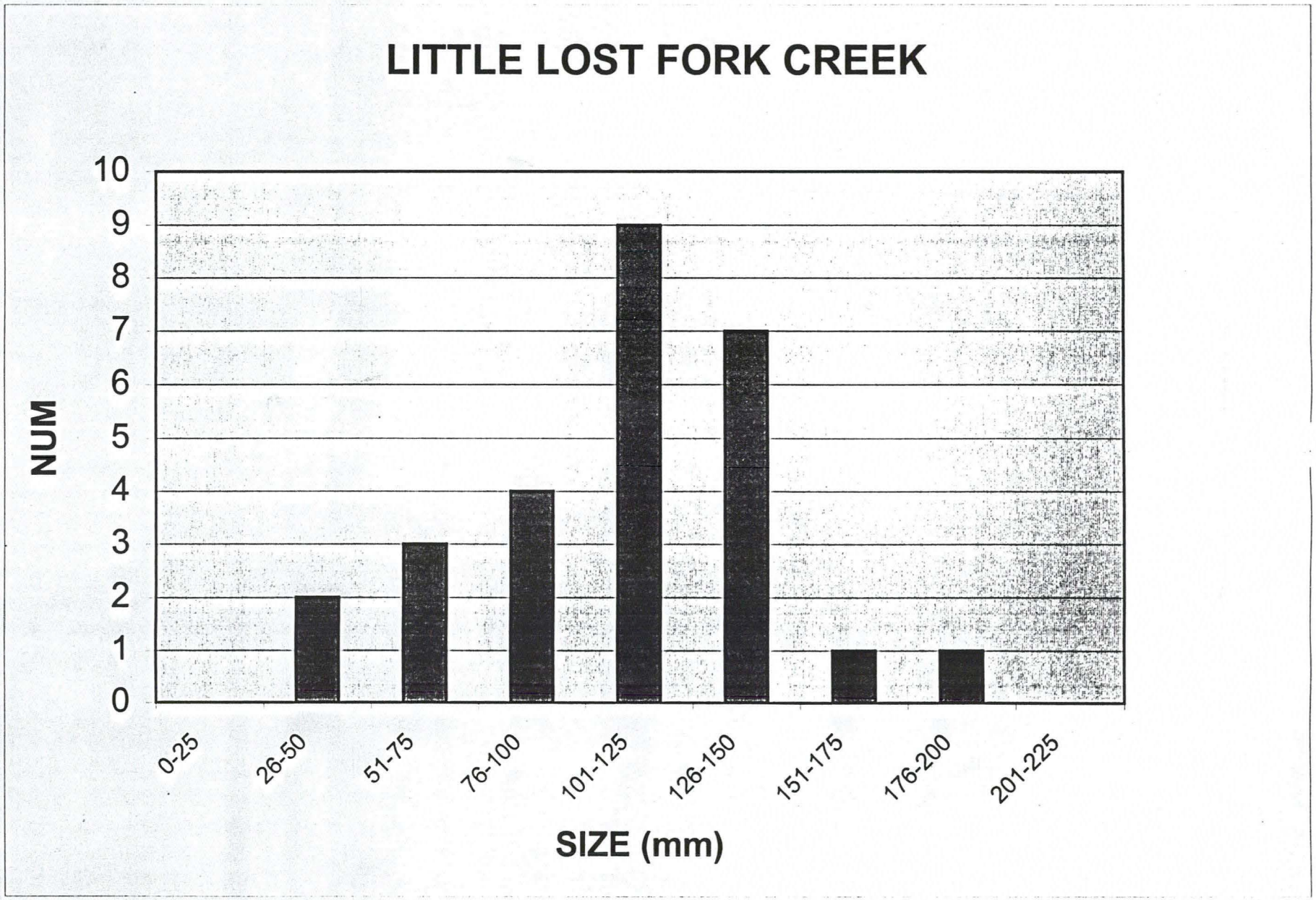

Appendix Figure 1. Continued




Appendix Figure 1. Continued




Appendix Figure 1. Continued

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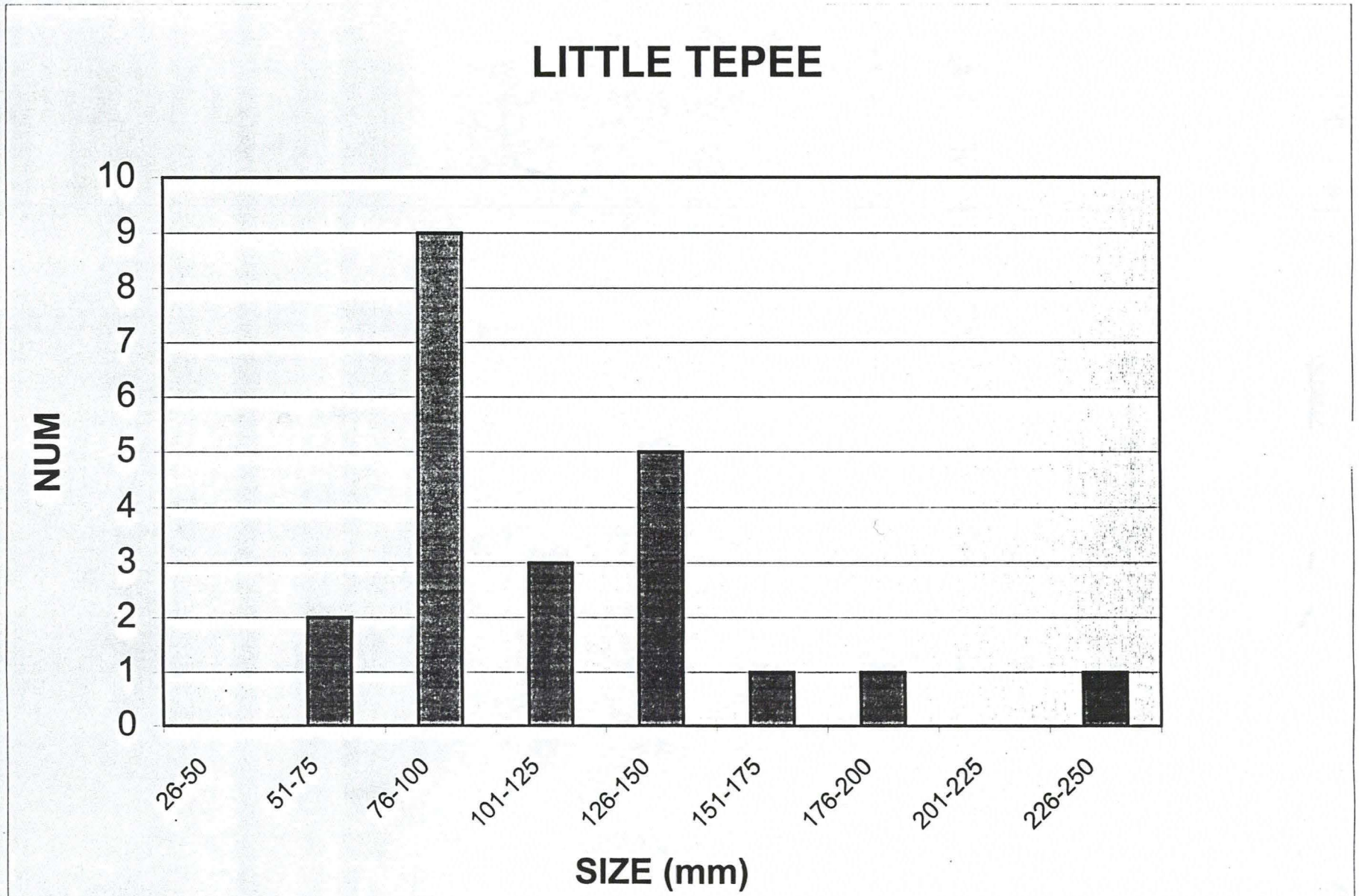


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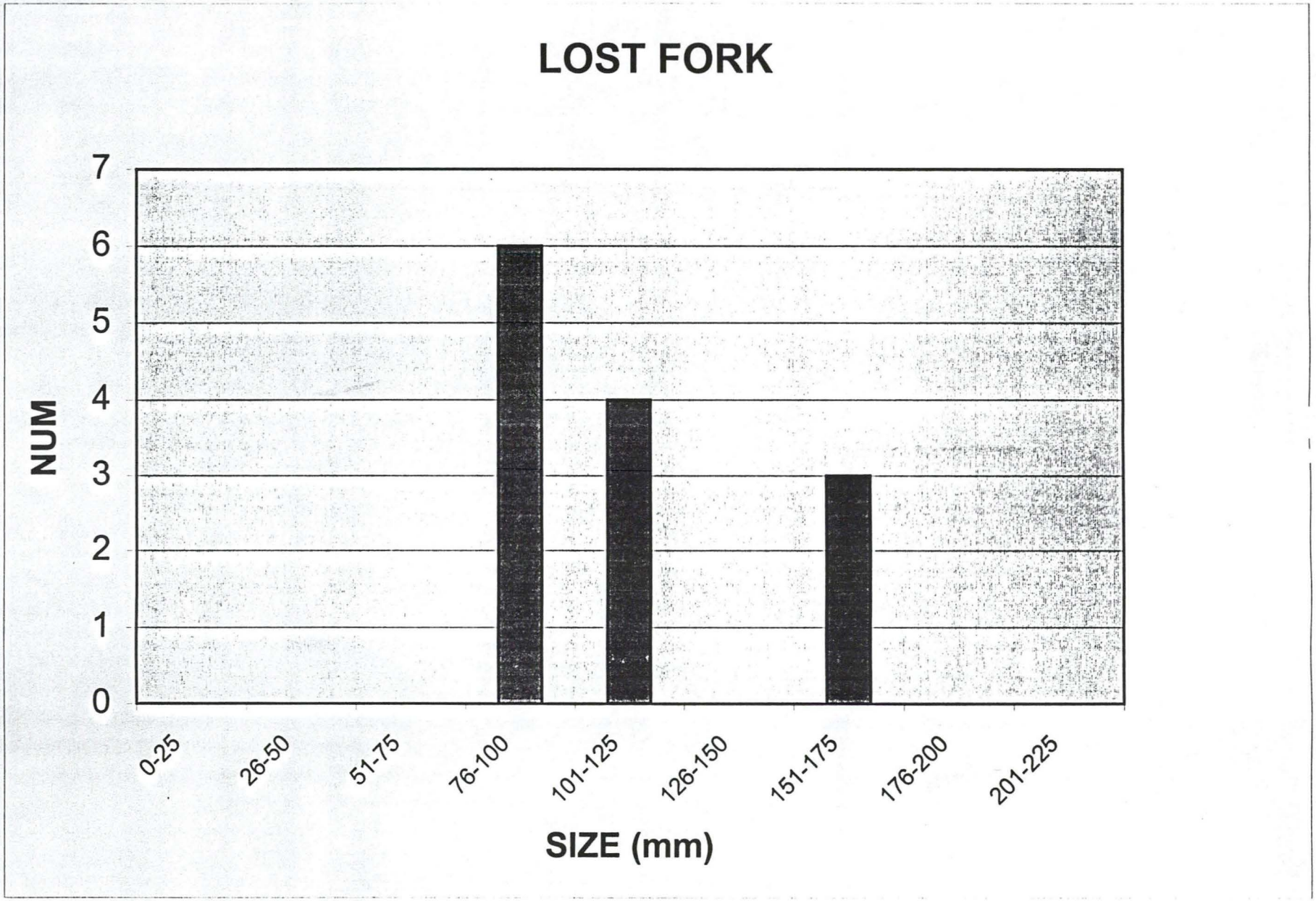


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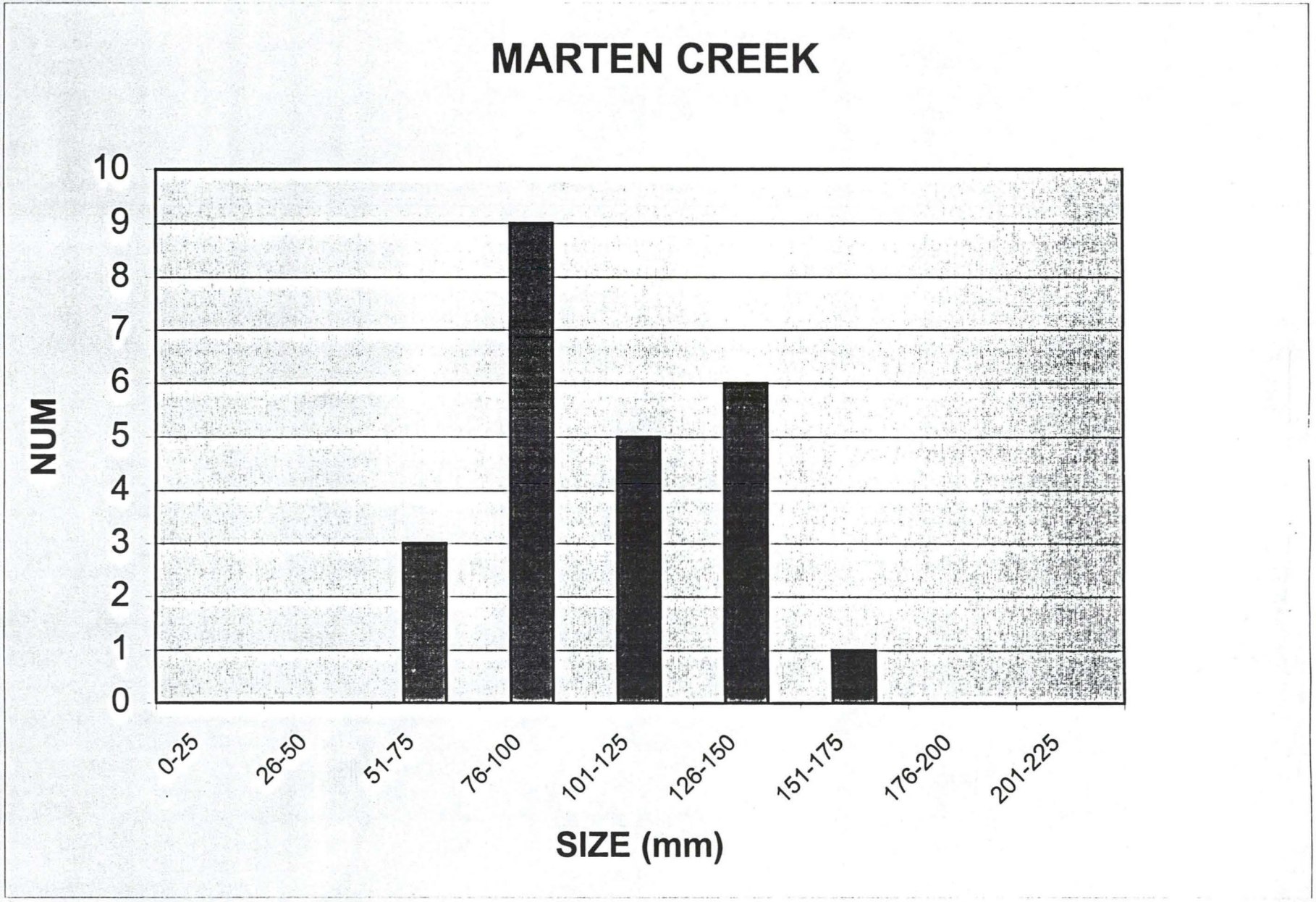


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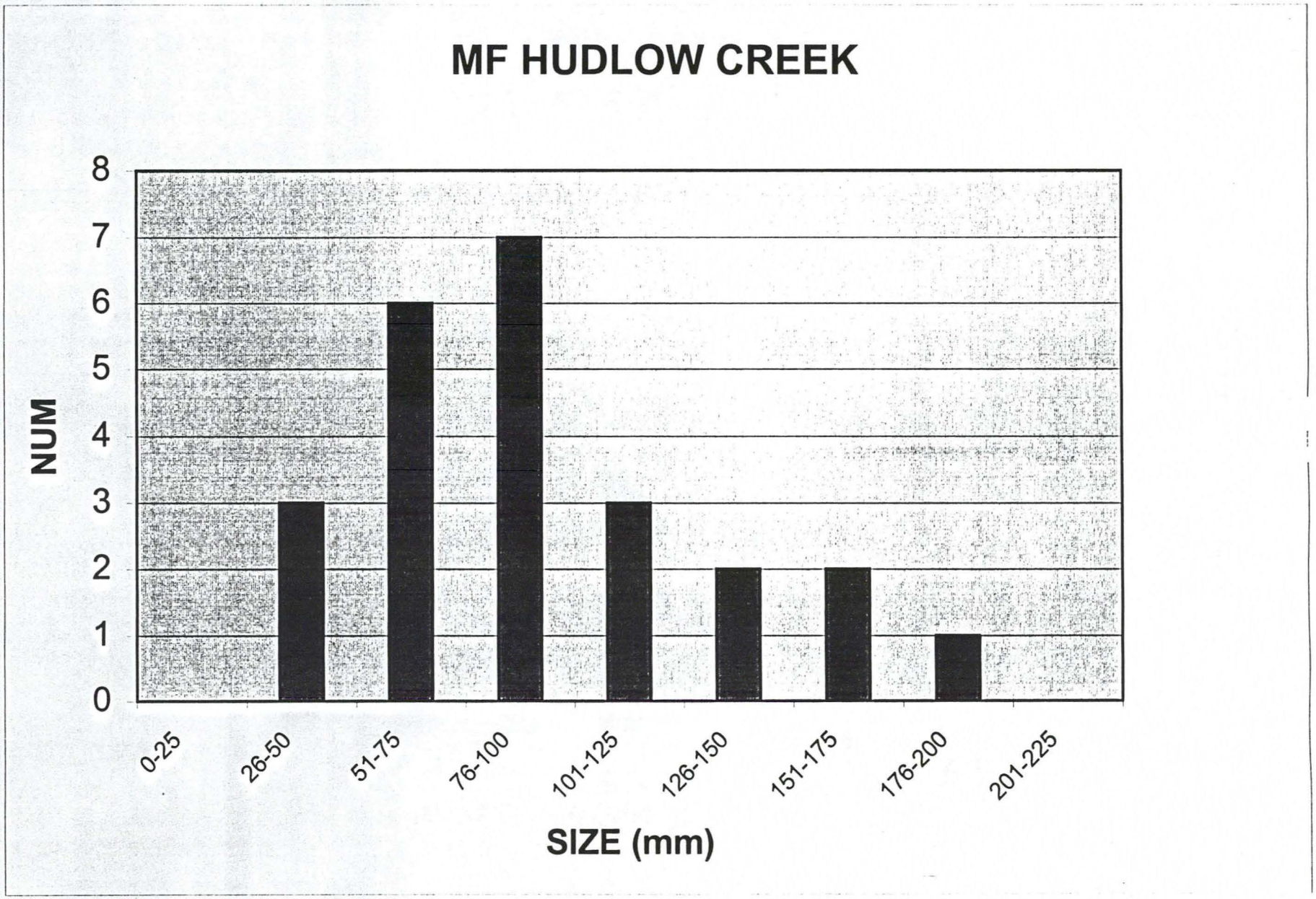


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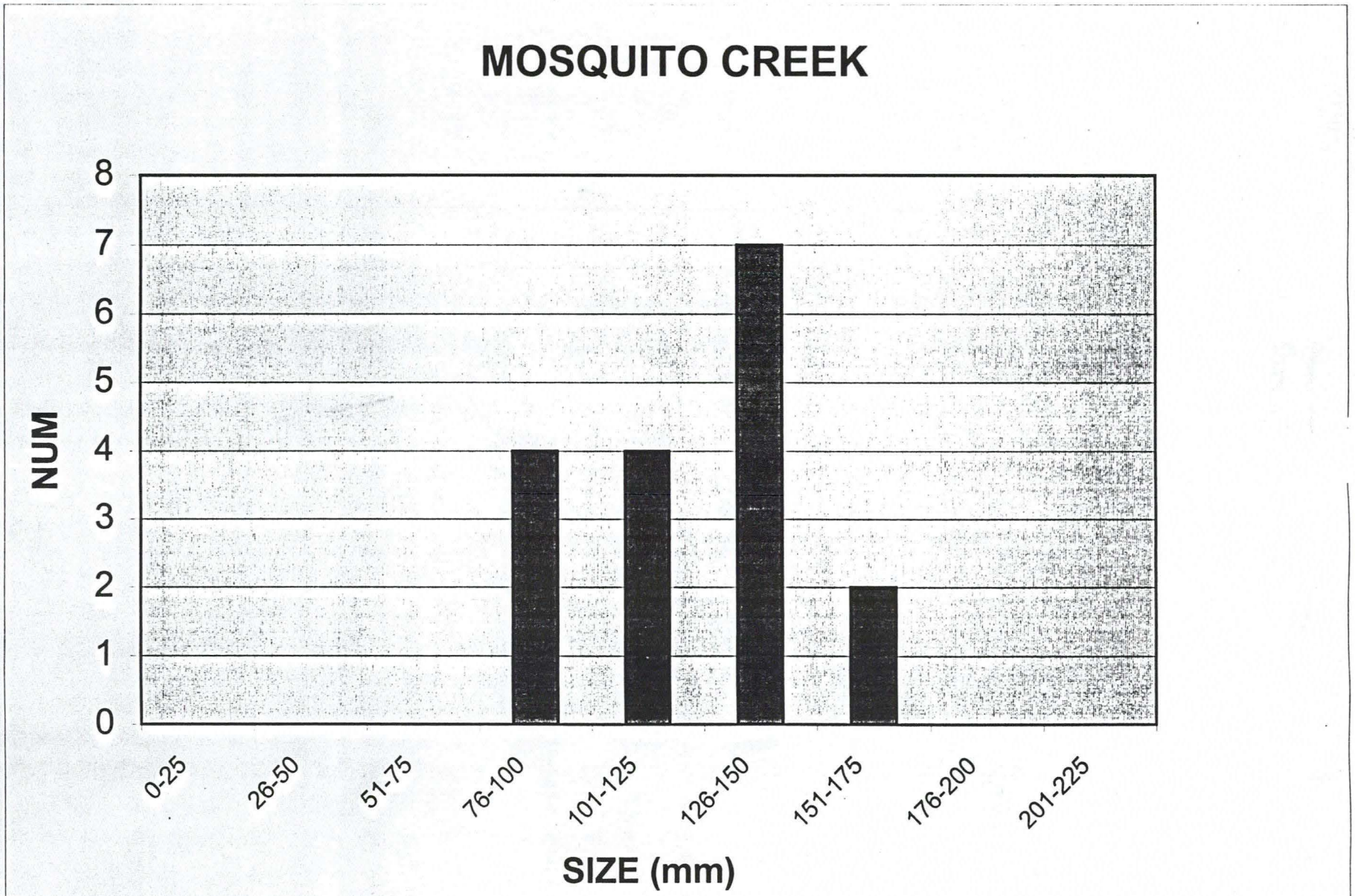


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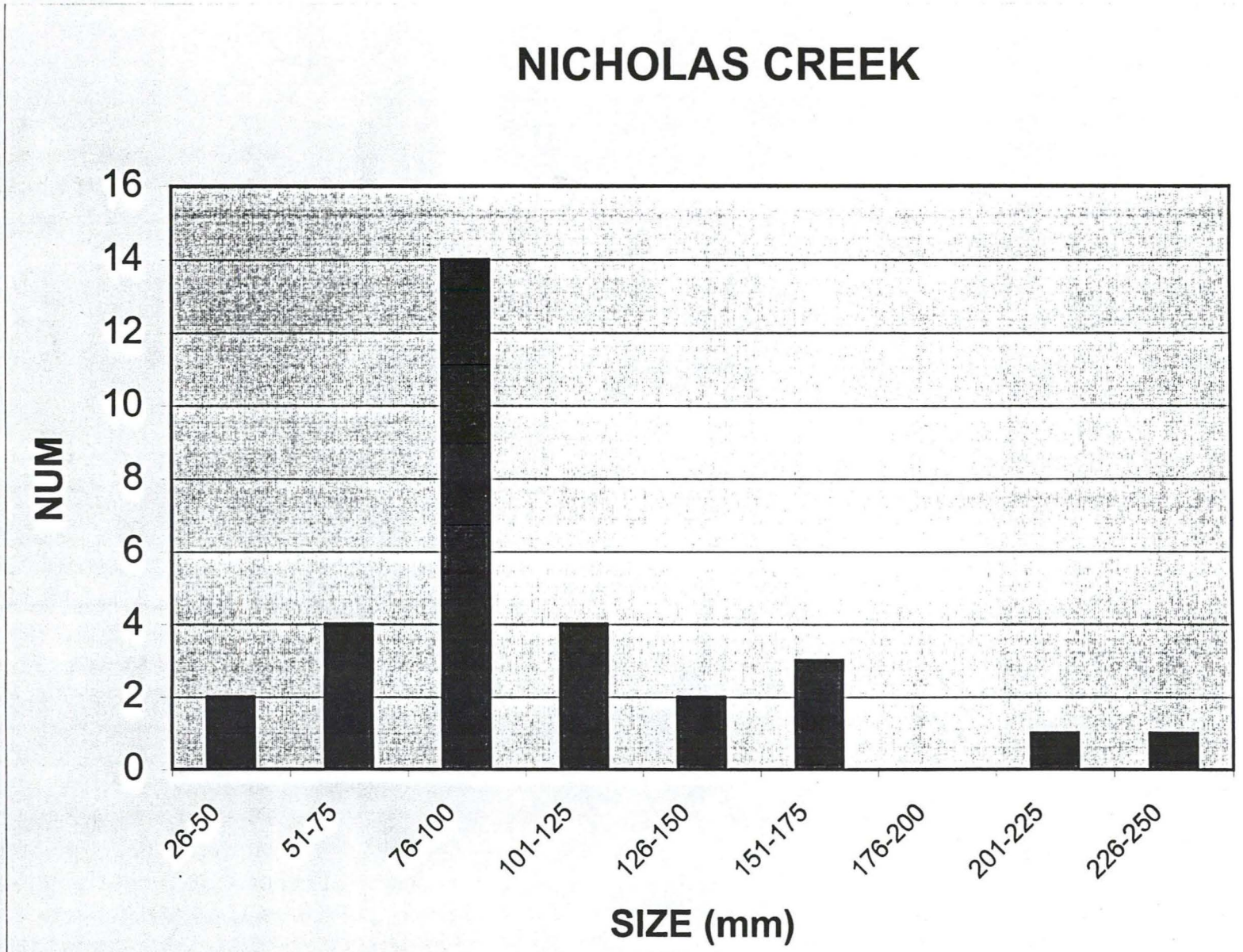


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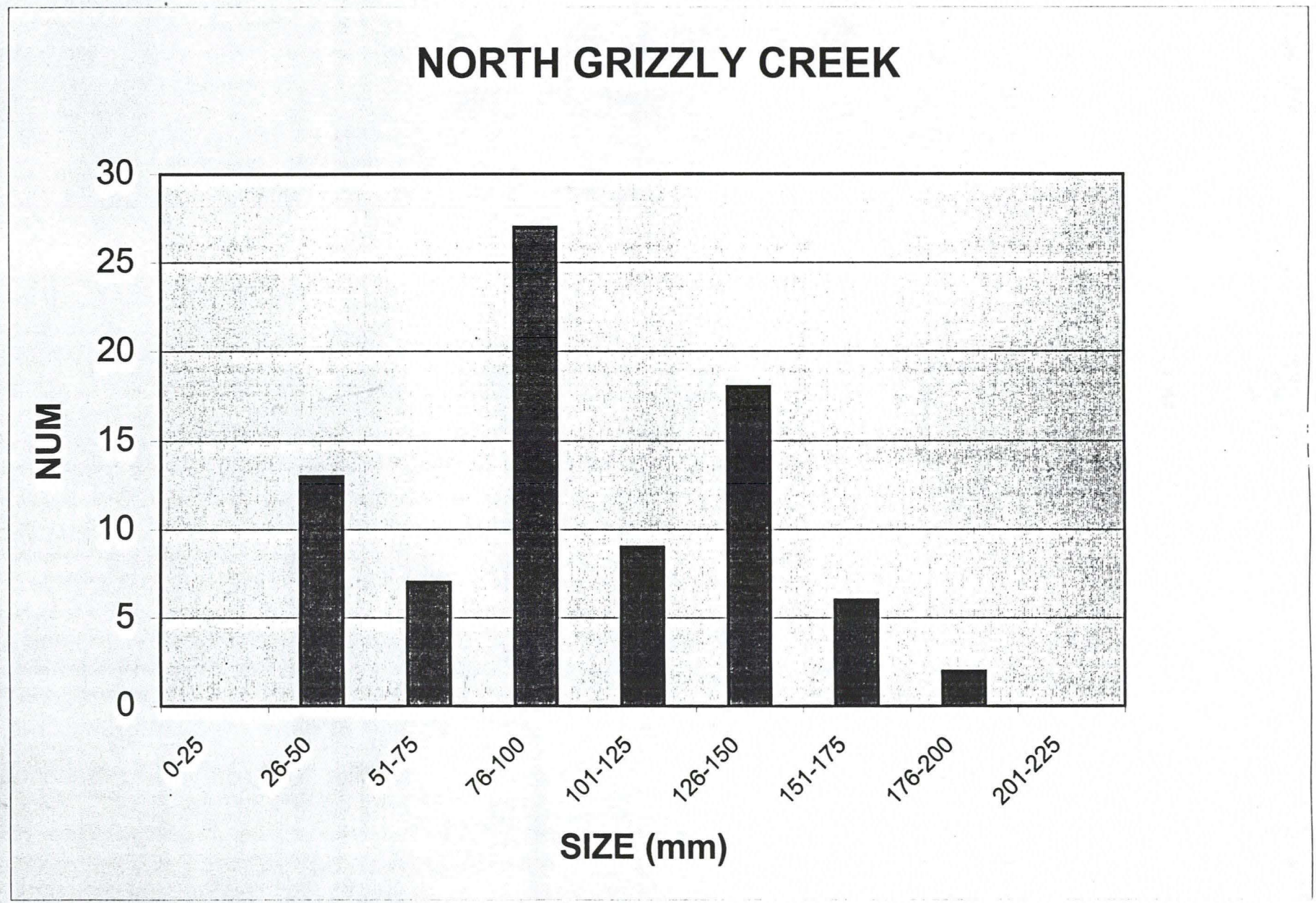


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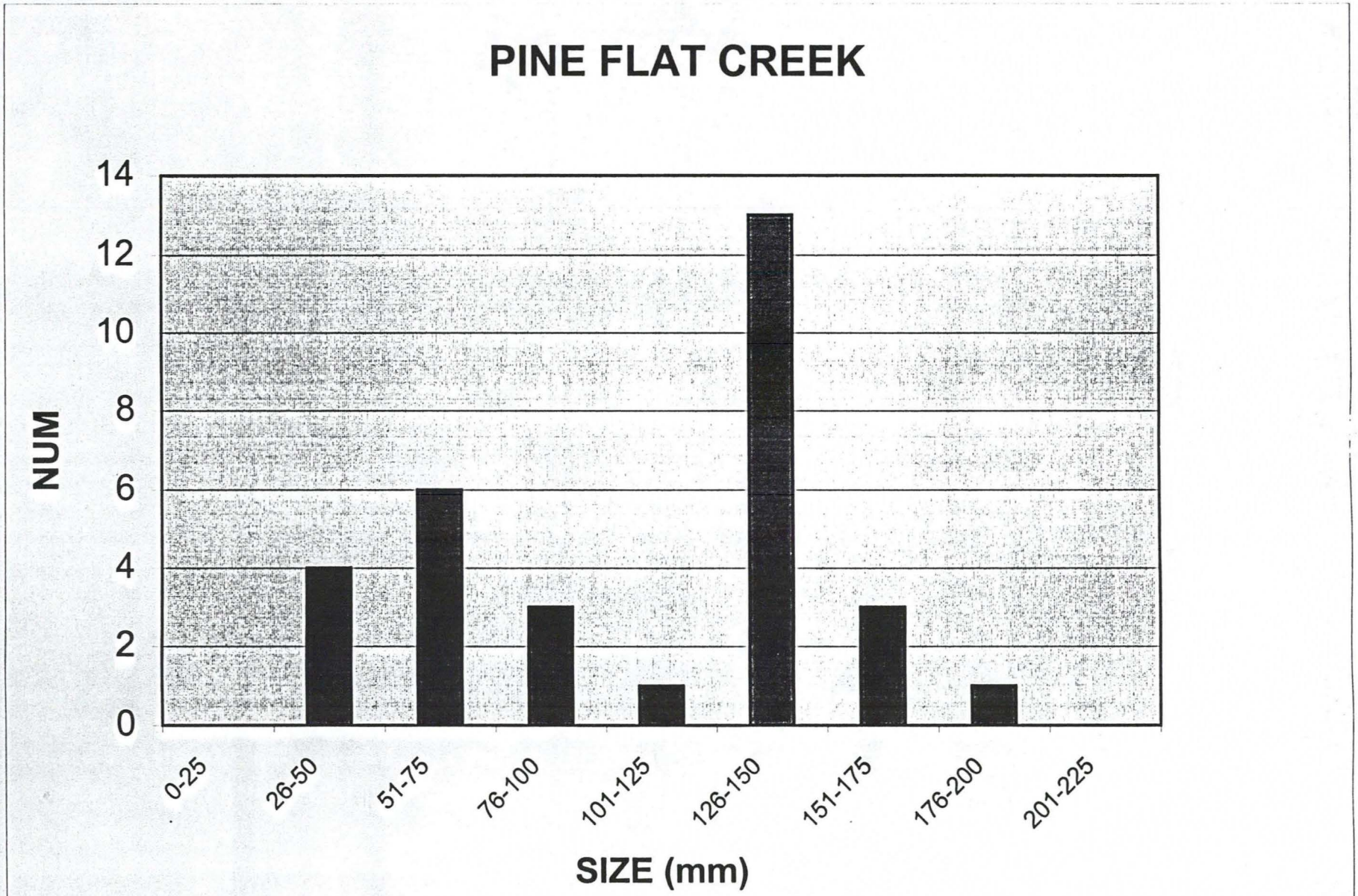


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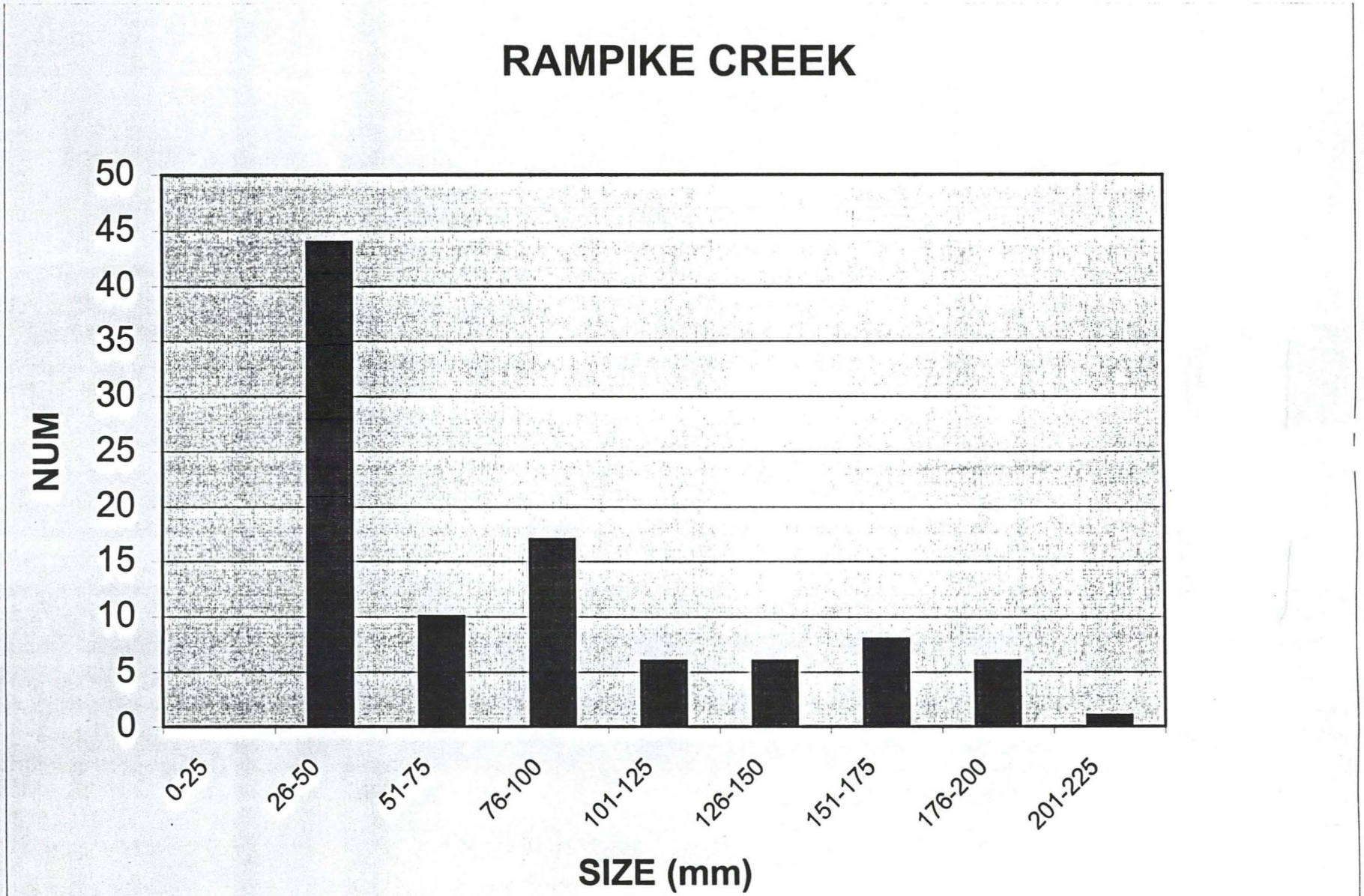


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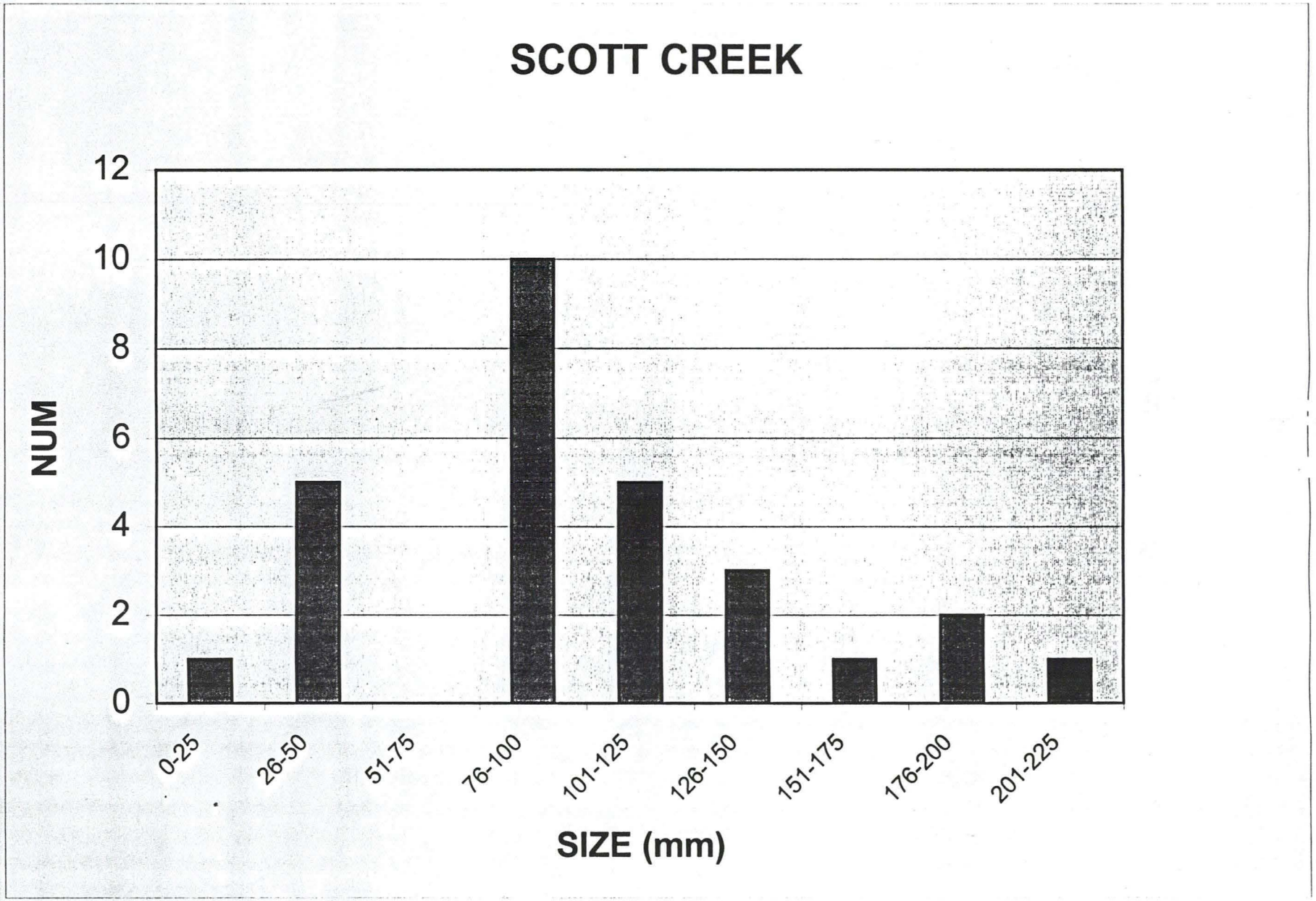


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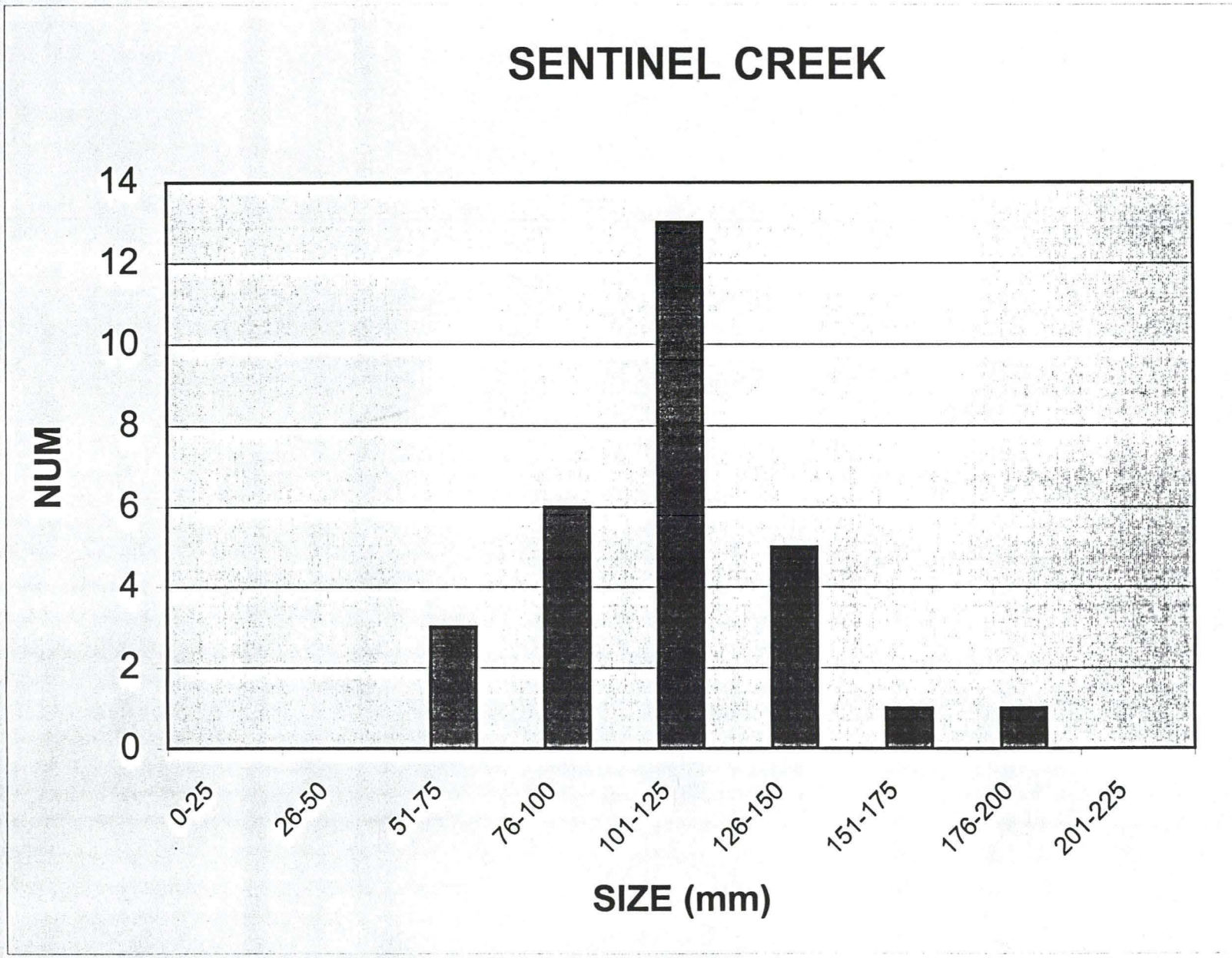


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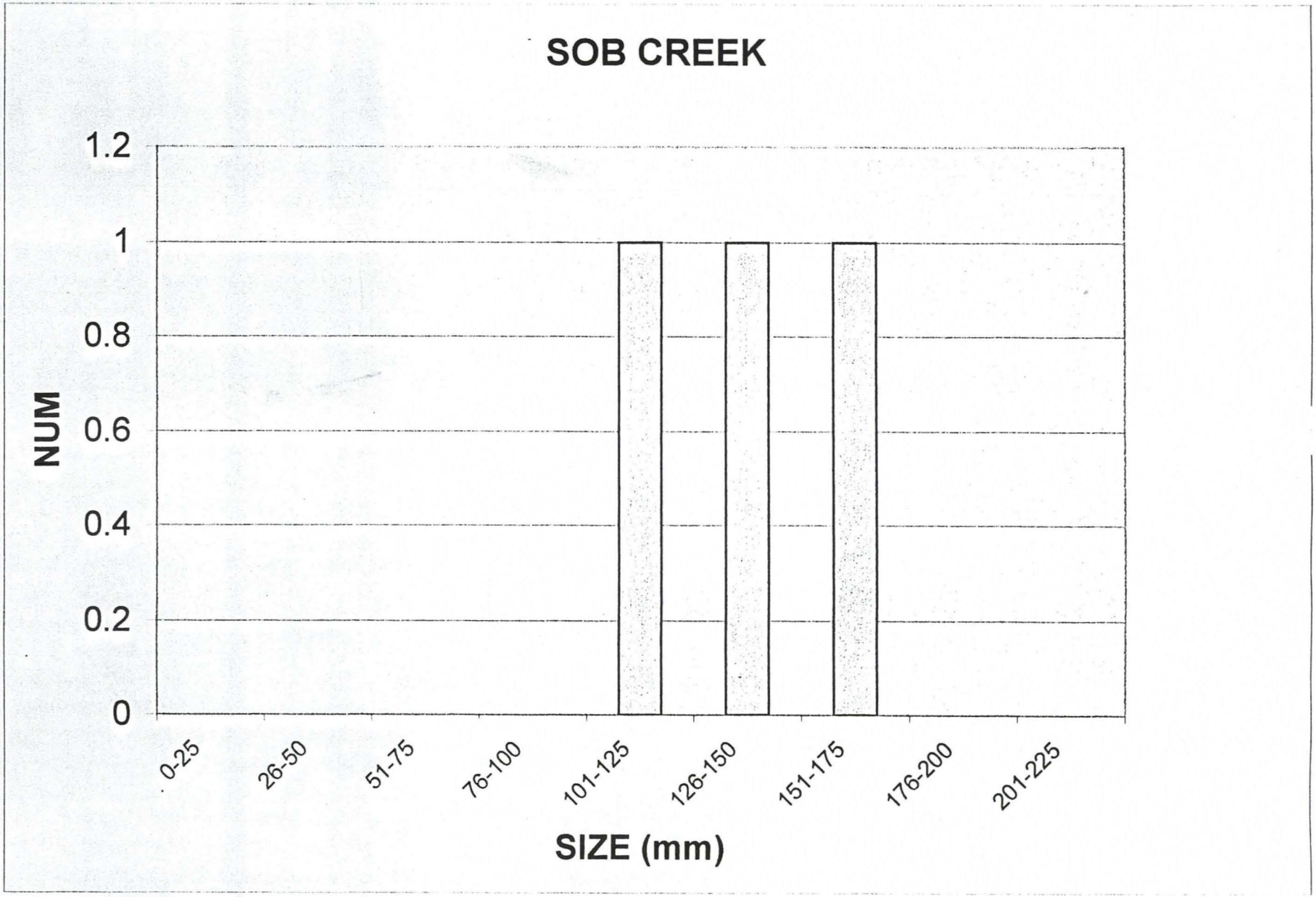


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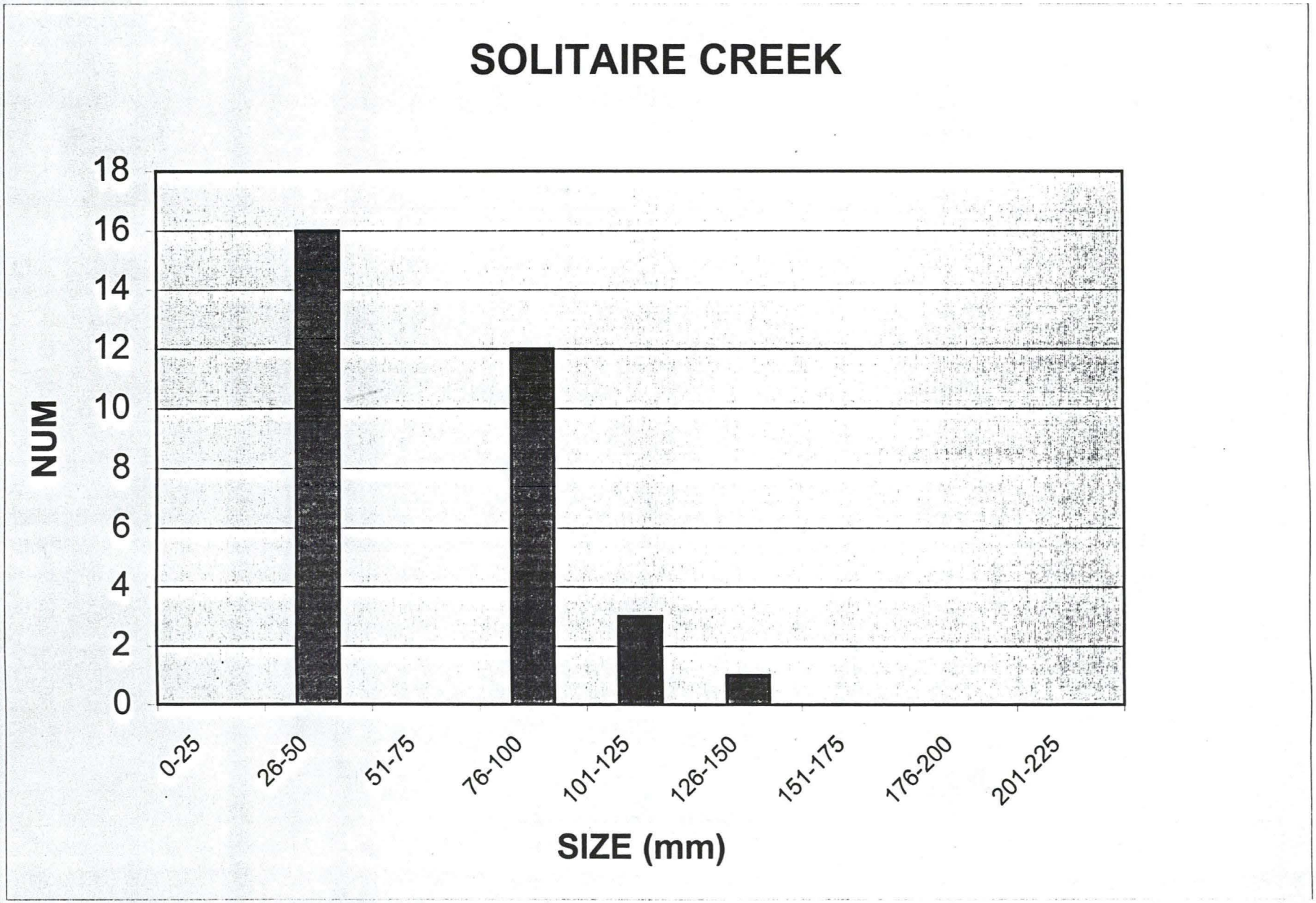


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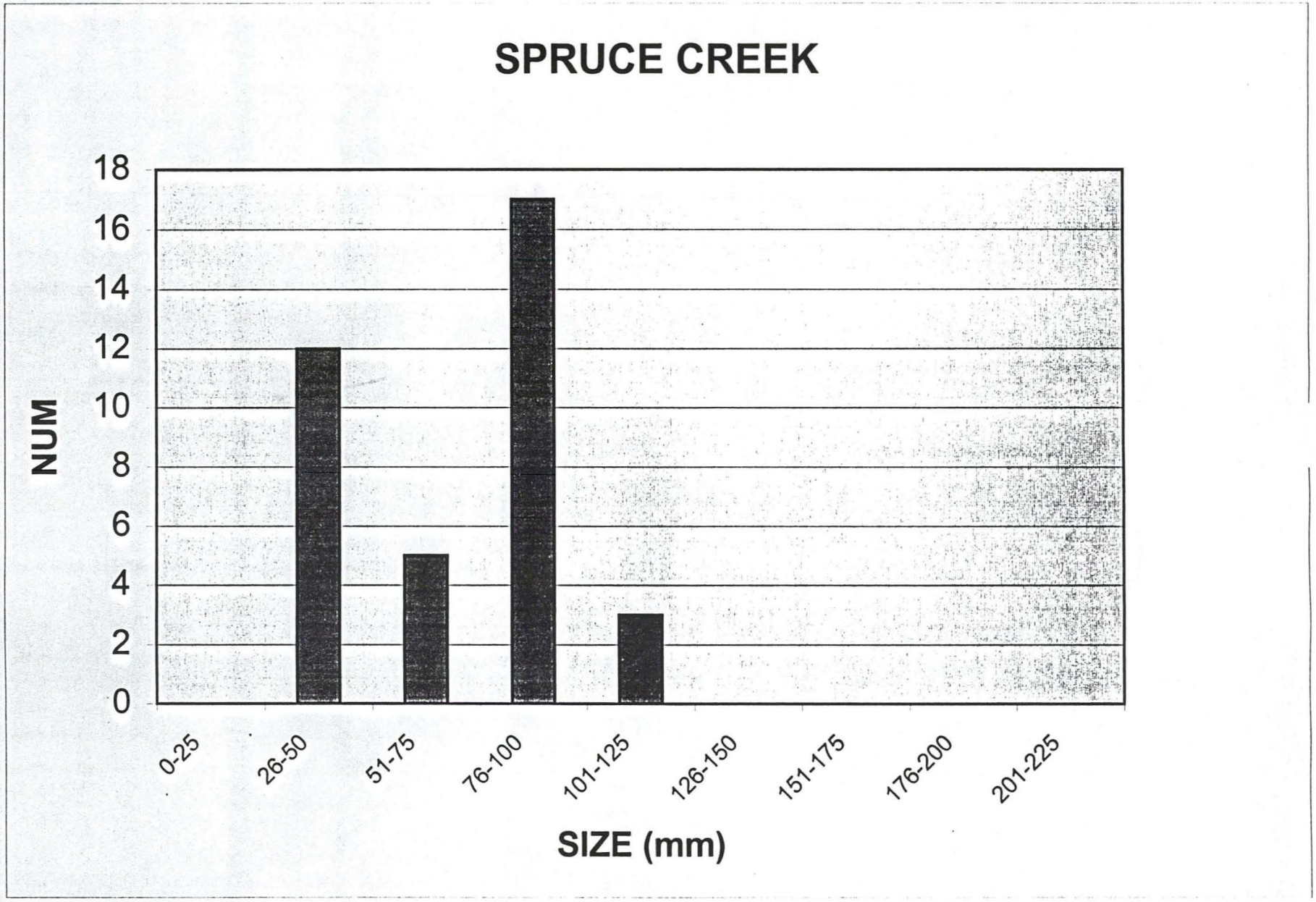


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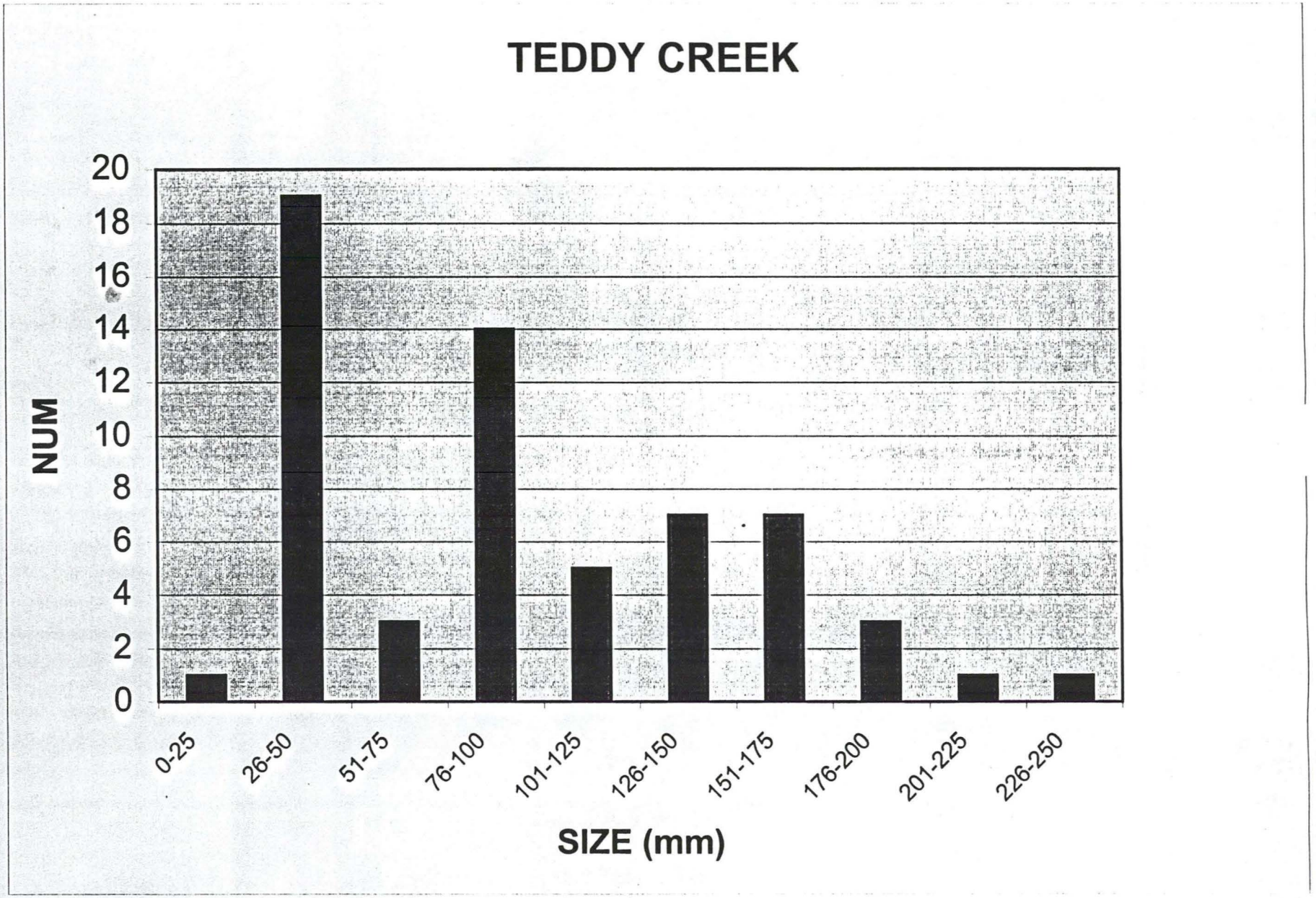


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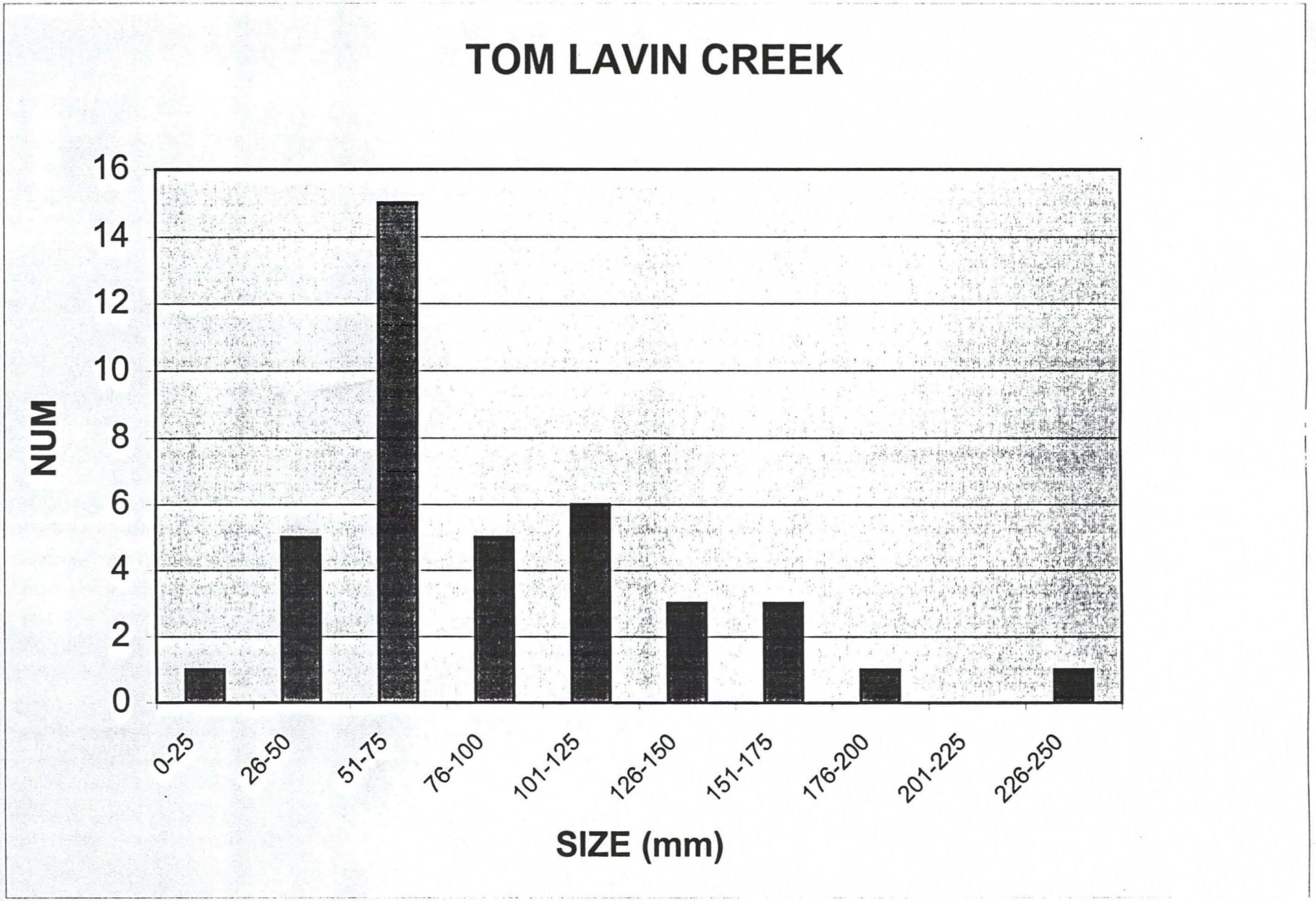


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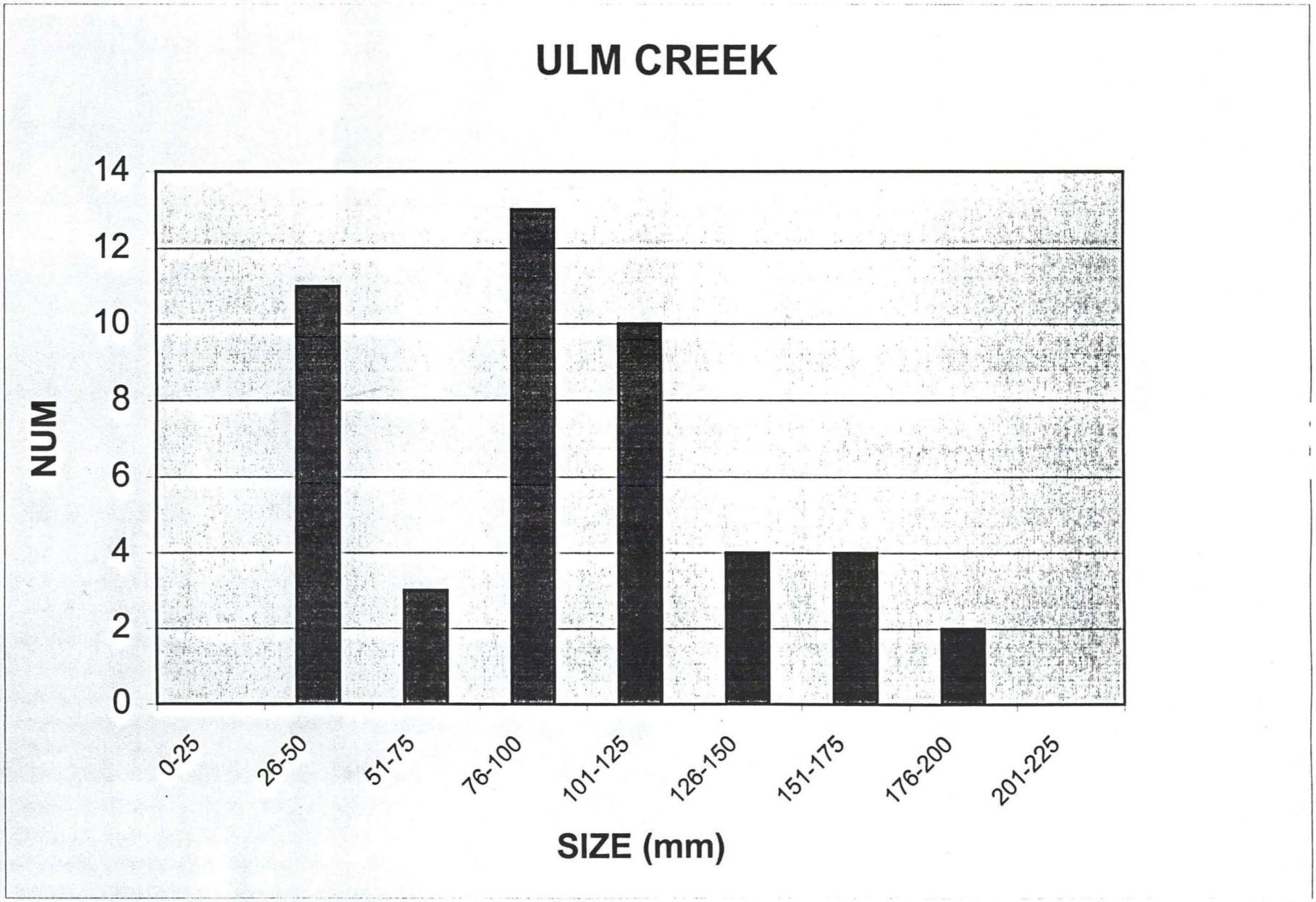


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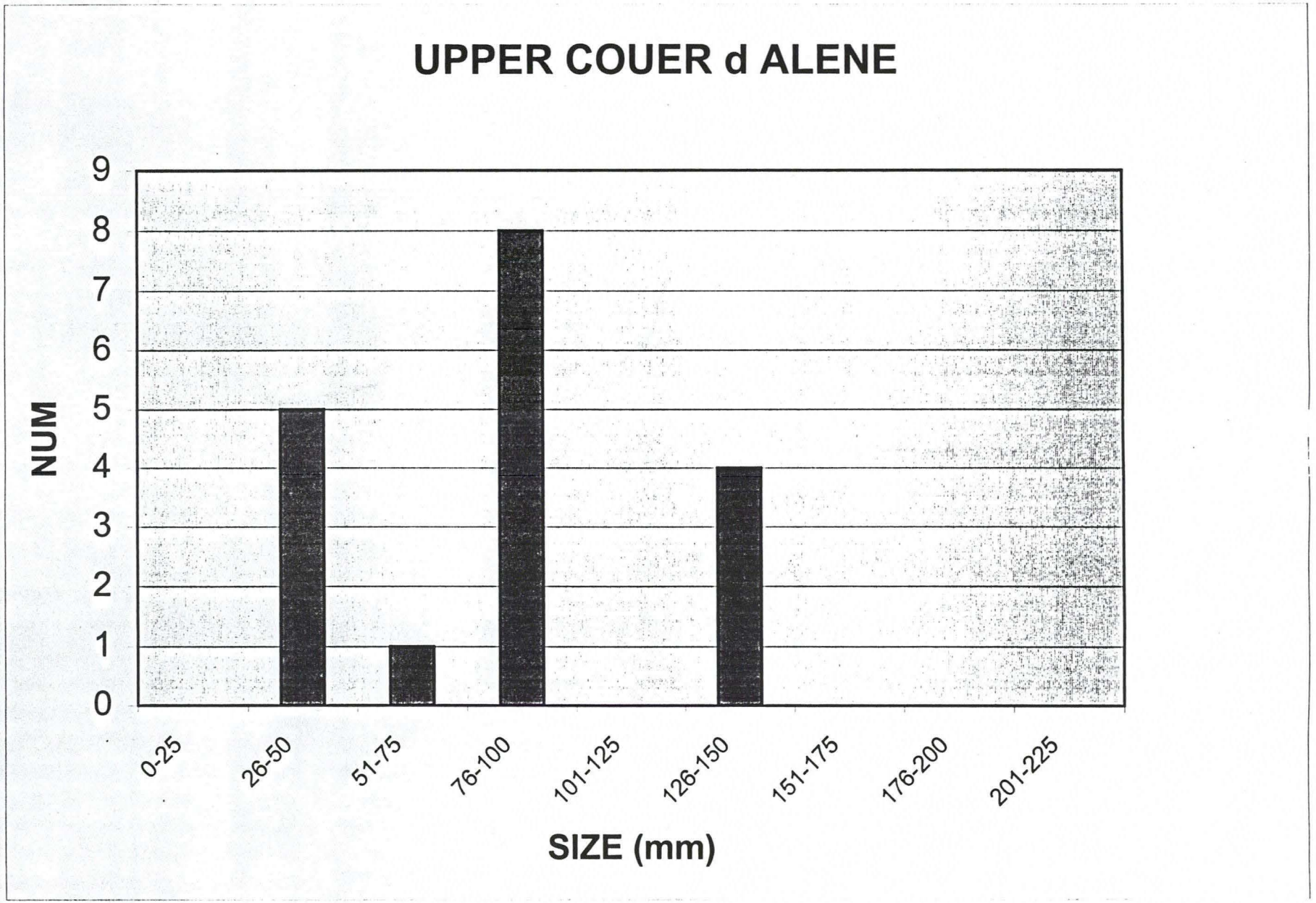


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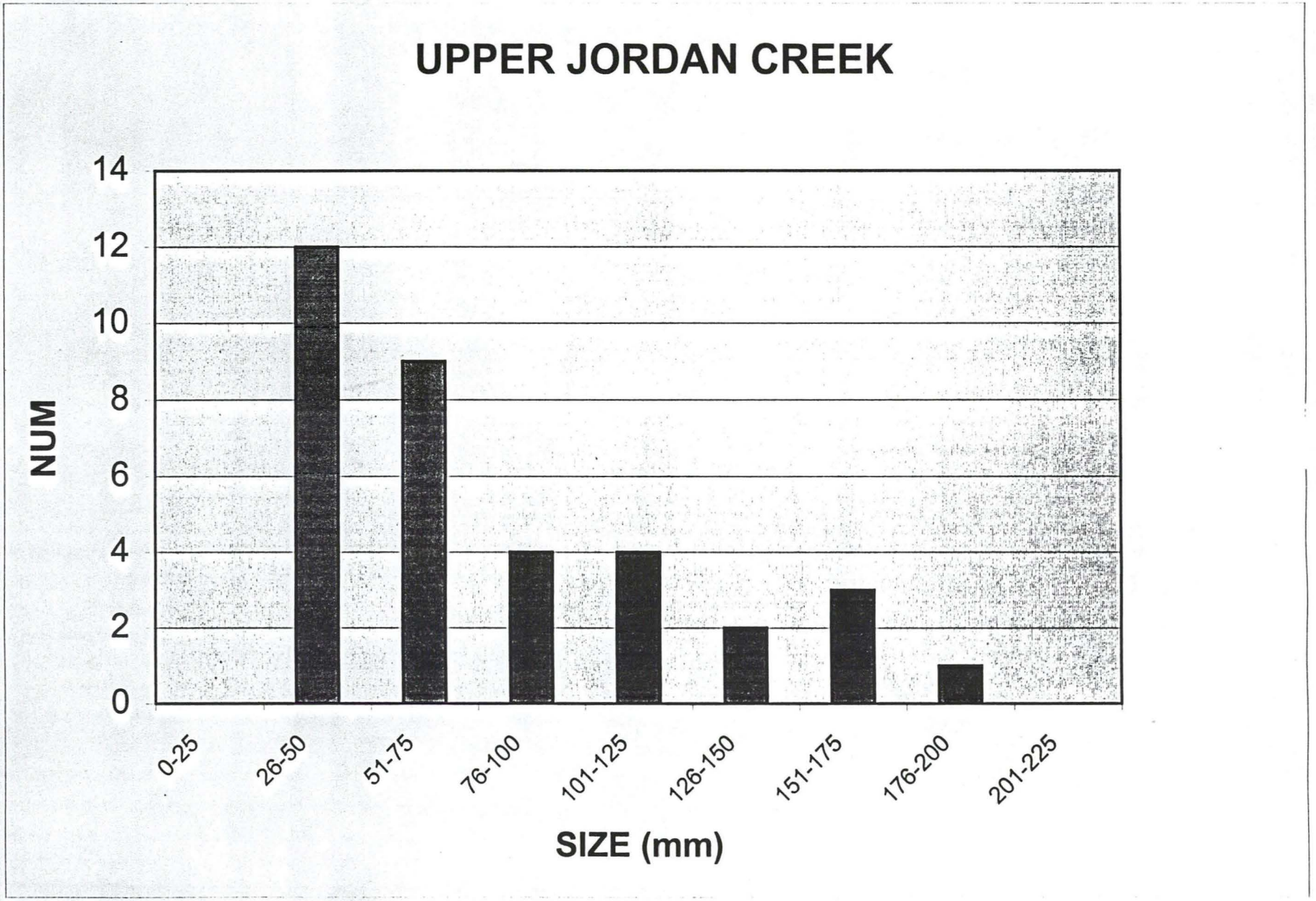


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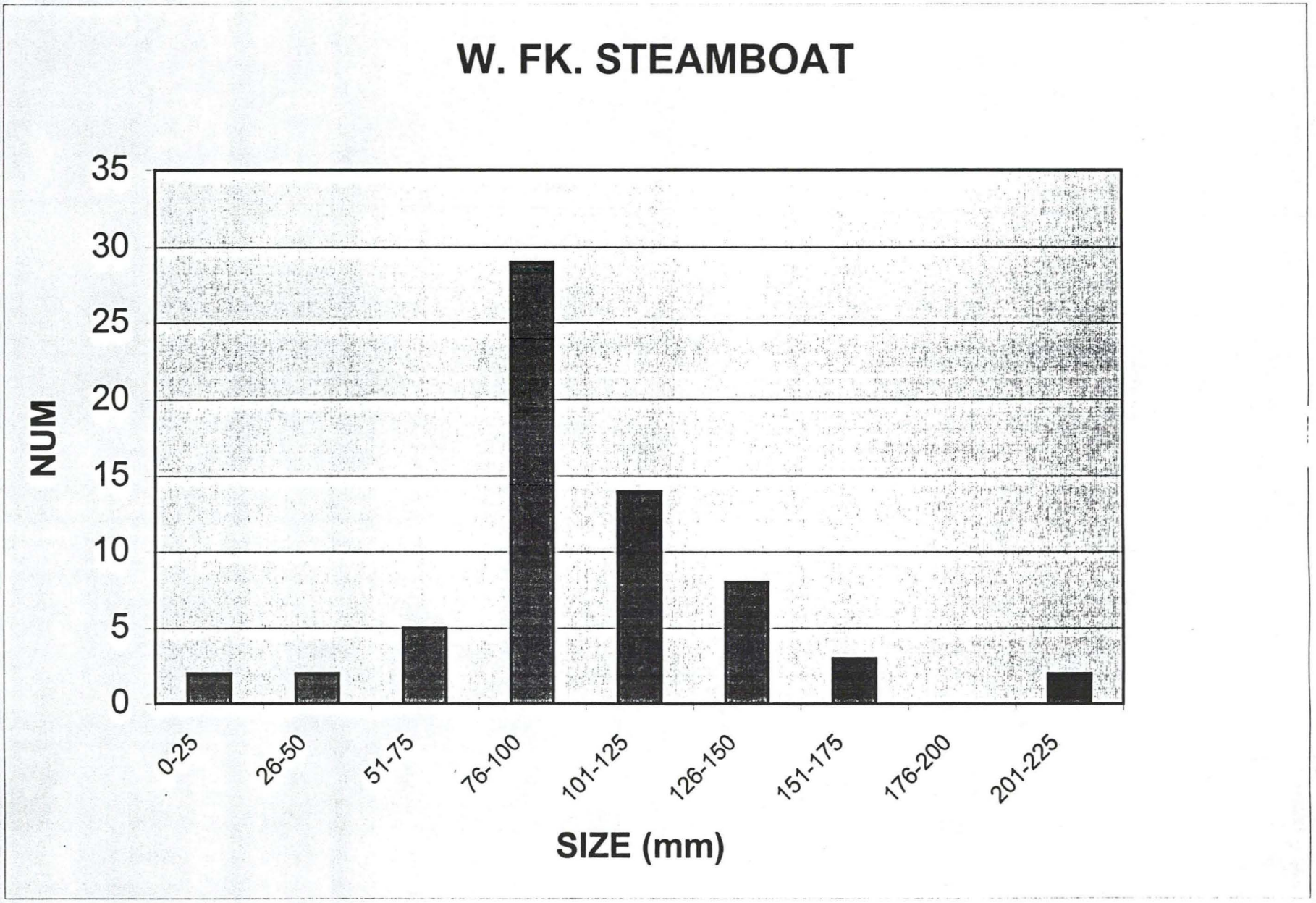


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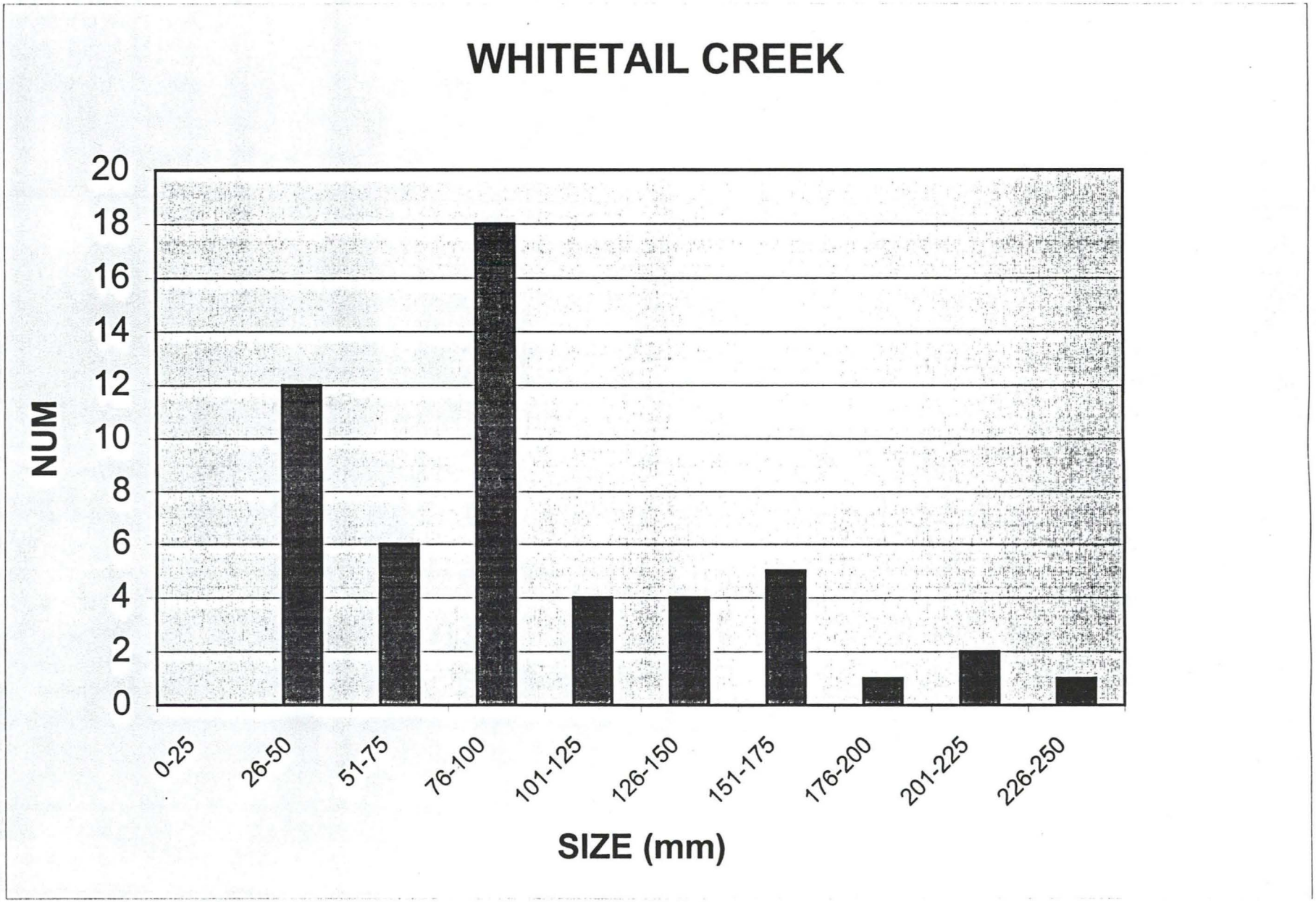


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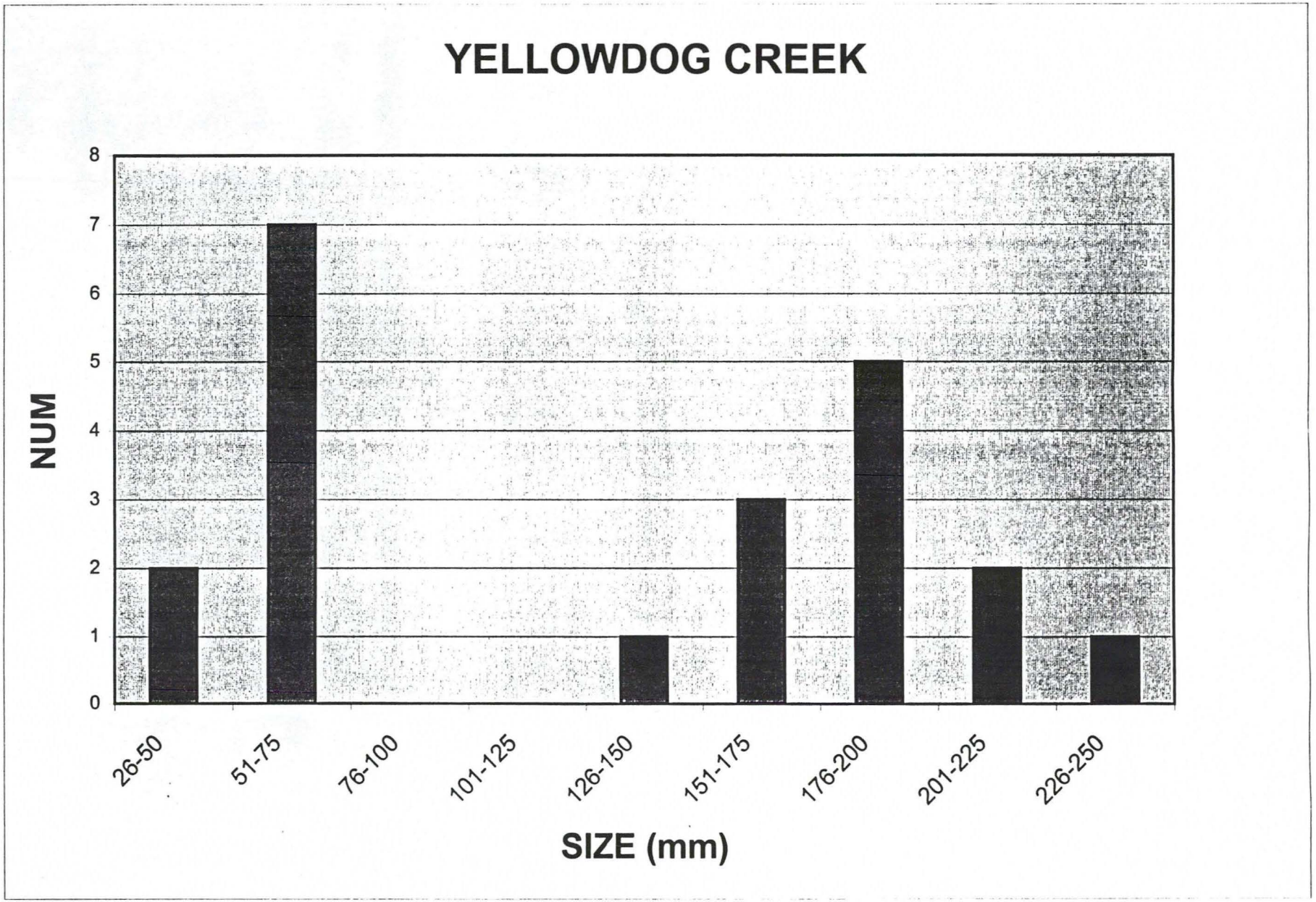


Appendix Figure 1. Continued